Study plan

Name of study plan: Bachelor program, unspecified specialization, in Czech, 2021

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Unspecified Branch/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 studijního plánu je ur ena pro ro níky, které byly p ijaty ke studiu od

akademického roku 2021/2022 do prezen ní formy studia bakalá ského programu. . Garant: prof. lng. 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. If you plan to profile the specialization Artificial Intelligence or Web Engineering, enroll in the course BI-AAG.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, Ond ej Guth Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-BAP.21	Bachelor Thesis 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 Jan Matoušek, Filip Glazar, Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Pavel K íž, Št pán Pechman, Dominik Roudný, 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 Jaroslav K íž, Ji í Bu ek, Filip Kodýtek, Róbert Lórencz, David Pokorný, Martin Šutovský, František Ková, Ivana Trummová, Jakub Tetera 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 Tomáš Kalvoda, 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 Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BI-OSY.21	Operating Systems Ladislav Vagner, Ji í Kašpar, Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík, Petr Zemánek Pavel Tvrdík Michal Štepanovský (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI.21	Computer Networks Josef Koumar, Petr Hoda , Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, 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, Ladislav Vagner, Jan Trávní ek, Miroslav Balík, David Bernhauer, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BI-PA2.21	Programming and Algorithmics 2 Radek Hušek, Ladislav Vagner, Jan Trávní ek, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP.21	Computer Structure and Architecture Jaroslav Borecký, Petr Fišer, Martin Kohlík, Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BI-TZP.21	Technological Fundamentals of Computers Jaroslav Borecký, Martin Da hel, Robert Hülle, Martin Kohlík, Pavel Kubalík, Vojt ch Miškovský, Martin Novotný, Jan ezní ek, Miroslav Skrbek, 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, Alena Libánská, Tomáš Nová ek, Petra Pavlí ková, Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BI-UOS.21	Unix-like Operating Systems Zden k Muziká, Petr Hoda, Dana ermáková, Viktor erný, Michal Hažlinský, Jakub Jan i ka, Miroslav Prágl, Michal Šoch, Jan Trdli ka, 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

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

Algorithms and Graphs 1

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 | 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.

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

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 will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 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 5
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 Newton's 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 Landau's 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 Taylor's 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 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 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 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

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 quarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek, Ond ej Guth 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 Josef Koumar, Petr Hoda, Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, 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

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

practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS.

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: Volitelné p edm ty oboru/specializace

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: Guarantor: prof. Ing. Róbert Lórencz, CSc., Email: robert.lorencz@fit.cvut.cz 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, Miroslav Prágl, Petr Zemánek 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 Michal Opler, Ond ej Suchý, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-ASB.21	Applied Network Security Ji i Dostál Ji i Dostál Ji i 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, Viktor Fischer Róbert Lórencz 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, Martin Šutovský, Tomáš Kiezler 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 Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-IOT.21	Internet of Things Jan Jane ek Jan Jane ek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-KOM.21	Conceptual Modelling Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-LA2.21	Linear Algebra 2 Jakub Šístek, Lud k Kleprlík, Karel Klouda 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 (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MDF.21	Modern Data Formats Jakub Klímek, Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	VO
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš 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 Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-OOP.21	Object-Oriented Programming Petr Máj, Filip K ikava, 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 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 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, Št pán Plachý 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 Radek Richtr, Ji í Chludil Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-PJS.21	JavaScript Programming Old ich Malec, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	VO
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Önd ej Bouchala, Mohamed Bettaz, Vojt ch Van ura, Jan Šafa ík, Adam Skluzá ek Martin Šlapák Vojt ch Van ura (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 Jan Matoušek, Radek Richtr, Marek Suchánek, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	VO
BI-SP2.21	Team Software Project 2 Ji í Mlejnek 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 Pavel Tvrdík (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 Lukáš Brchl, Marcel Ji ina, Jakub Novák Jakub Novák Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	VO
BI-SRC.21	Real-time systems Hana Kubátová Jaroslav Borecký Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TJV.21	Java Technology Ond ej Guth, Filip Glazar, Jan Blizni enko, Ji í Dan ek Ond ej Guth Ond ej Guth (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TPS.21	Computer Networks Technologies 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 Tomáš Vondra (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-UKB.21	Introduction to Cybersecurity David Pokorný, František Ková, Ivana Trummová, Tomáš Lu ák, Tomáš Rabas David Pokorný Róbert Lórencz (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 Tyrdík 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 Simona Forn sek, Marián Svetlík, Dominik Novák Simona Forn sek Róbert Lórencz (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
	e courses of this group of Study Plan: Code=BI-PS-ALL.21 Name bc. program Informatics, ver. 21	e=Profiling (future c	ompulsor	ry) course	s of all
-	nix Administration			7	,ZK	5
Students will learn the international between user and administration	al structure of the UNIX operating system, with the administration of its basic subsystems ator roles. They will get theoretical and practical knowledge of user management and ad	lministration, of u	sers acces	oles. They will ss rights, file s	understand the	ne difference: subsystems
processes, memory, network specific examples from pract	services and remote access, and in the areas of system deployment and virtualization tice. The services and remote access, and in the areas of system deployment and virtualization tice. The services and remote access, and in the areas of system deployment and virtualization to be a services. The services are the services	in the labs, the	y will verify	tne knowled	ge from the le	ctures on
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Characteristics of	the courses of this group of Study Plan: Code=BI-PS-ALL.21 Name=Profiling (future comp	ouisory) cour	ses of all
specializations of	the bc. program Informatics, ver. 21		
BI-ADU.21	Unix Administration	Z,ZK	5
Students will learn the in	riternal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. Ti	hey will understan	d the differences
between user and admi	nistrator roles. They will get theoretical and practical knowledge of user management and administration, of users access righ	nts, file systems, o	lisk subsystems
processes, memory, ne	twork services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the k	nowledge from th	e lectures on
specific examples from	practice.		
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
Students will get acqua	inted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a	nd backup compl	ex database and
web service systems. T	he 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	Z,ZK	5
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	.21. It further
delves into advances da	ata structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For En	glish version of th	ne course see
BIE-AG2.21.			
BI-ASB.21	Applied Network Security	Z,ZK	5
The aim of the course is	s to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge ga	ined in course BI-	-PSI with actual
security applications lik	e the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishir	ng the course stud	dent will get
knowledge of security a	applications in computer networks.		

BI-APS.21 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 systems. BI-BEK.21 Secure Code The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. BI-BIG.21 DB Technologies for Big Data 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. BI-EPP.21 **Economic Business Processes** Z.ZK 5 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 **Ethical Hacking** Z.ZK 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. Z,ZK 5 Financial Business Intelligence BI-FBI.21 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 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 Z.ZK Internet of Things 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 Z,ZK 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. 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 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-MPP.21 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. 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-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	igmented reality, v	risualization 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 \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ ment \ deal \ with \ the \ content \ creation \ for \ the \ deal \ with \ the \ content \ creation \ for \ the \ deal \ deal \ with \ the \ content \ deal \ deal \ with \ the \ content \ creation \ for \ the \ deal $	ioned technologie	s, namely fractal
and procedural visualiz	ation, scientific data visualization, and 3D model scanning.		
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
	d with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wo		
	will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to		•
= -	n to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the	ne principle of ope	ration and use
	cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.		
BI-OOP.21	Object-Oriented Programming	Z,ZK	5
	mming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth		-
-	quainted with the main principles of object-oriented programming and design, used in modern programming languages. The er	mpnasis is on prac	ctical techniques
	, which includes testing, error handing, refactoring, and application of design pattern.	7 71/	
BI-PGR.21	Computer graphics programming	Z,ZK	5
-	se, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design naterials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		- 1
-	ine, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe		
	ent, 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
	roduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose i	1 1	-
	ion and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	-	
methods on data from r			
BI-PNO.21	Practical Digital Design	KZ	5
	ew of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand t	1	-
-	chnologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		
tools.		•	
BI-PAI.21	Law and Informatics	ZK	5
The aim of the course is	s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge	of doing business	in the Czech
Republic and will be ale	erted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding co	ontracts in real an	d Internet
environment, will know	their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able	to use commerci	al license types
and open-source licens	es. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	on against their mi	suse. Students
will also be alerted to s	uch behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses o	of real cases from	practice.
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
Students learn basic co	empiling methods of programming languages. They are introduced to intermediate representations used in current compilers	GNU and LLVM. T	hey learn to
•	f a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification	n. The compiler ca	n translate not
	nguage but any text in a language generated by a given LL input grammar.		
BI-PPA.21	Programming Paradigms	Z,ZK	5
	pasic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of		
	and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming		
	d on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main	nstream programm	ing languages
such as C++ and Java.	December of Openin Applications	7.71/	
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
	the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of further enhancement of the presented software tools, both usin		
by implementation of pl	, , , , , , , , , , , , , , , , , , , ,	ig built-in scripting	languages and
BI-PJS.21		KZ	5
	JavaScript Programming uction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code devel		
		KZ	5
BI-PYT.21	Python Programming s to get acquainted with basic efficient control and data structures of the Python programming language for text and binary da		-
	programming in Python and in other programming languages will be explained. Each topic is prepared for students in the form	· -	
	to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semes		
the semester.	to individual stations work. Belore each lab, stations pass a short test on the last week topic. Four nomeworks plas a series	ter work will be as	Signed during
BI-PRR.21	Project management	Z,ZK	5
	s to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, ar		-
	, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk	=	-
• •	schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for		
	dge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I		
also suitable for all thos	se who will develop software or hardware in the form of team projects.		
BI-SIP.21	Network Programming	Z	5
The course covers fund	lamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level prog	ramming using B	
second part is devoted	to designing communication protocols and their verification. The third part introduces the principles and applications of middle	eware technologie	s. The final part
introduces basic moder	n models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in co	omputer labs usin	g a chosen
programming language	environment.		
BI-SWI.21	Software Engineering	Z,ZK	5
Students get acquainte	d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	y consolidate and	practically verify
	the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han	· ·	
-	ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig	_	hin the course,
	eoretical basis in the field of project management, estimation of costs of software projects, and methods of their development	1	
BI-SP1.21	Team Software Project 1	KZ	5
_	n experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		
•	eaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The te-		
and finished in the BIE-	consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	antenact will be fu	ruler developed
and minorited in the DIE-	OI 2 (000130).		

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BI-SP2.21 Students gain hands-on	Team Software Project 2 experience with the iterative development process while working on a large-scale software project. The first iteration is the res	KZ sult of the BIF-SP	5 1 course projec
<u>-</u>	ip, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will wo		
	e team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their s		
BI-SPS.21	Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is	to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administr	rated under the or	erating system
inux 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	d by practical hand	ls-on experienc
with real network infrast	ructure.		
3I-ML1.21	Machine Learning 1	Z,ZK	5
•	is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working l		
	the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relations		
	fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensic and scikit libraries in Python will be used.	onai dala visualiza	ation. in practica
BI-ML2.21	Machine Learning 2	Z.ZK	5
	is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in	1 '	_
-	the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction met	•	
	procedure to the control of the cont	,	901
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
-	coming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate	'	_
•	ifferent types of camera systems and a variety of methods for image and video processing. The course is focused on practical	•	
problems of practice that	at the graduates may encounter.		
BI-SRC.21	Real-time systems	Z,ZK	5
Students obtain the bas	ic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue	es. Theoretical kn	owledge from
ectures will be experime	entally 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.		1	
BI-TJV.21	Java Technology	Z,ZK	5
-	nowledge and skills for developing information systems and applications through concepts used in software development and	experience with li	braries and tool
	system. At the course end, the students are able to develop software systems in Java platform.	1	
BI-TPS.21	Computer Networks Technologies	Z,ZK	5
	students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the phys		
	provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies are explained to the labs, the respective technologies are explained to the respective technologies and explain the respective technologies.	ū	
vith the most important Always with focus on hig	ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Eth	nernet, modern wi	reiess networks
	·		
21 TIC 21	Information Systems	7 7K	5
_	Information Systems is to familiarise students with the information systems tonic and information systems implementation principles. During the co	Z,ZK	5 e introduced to
The goal of this course	s to familiarise students with the information systems topic and information systems implementation principles. During the co	ourse, students ar	e introduced to
The goal of this course on the market" existing	is to familiarise students with the information systems topic and information systems implementation principles. During the couples of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other	ourse, students ar er types of inform	e introduced to ation systems.
The goal of this course on the market" existing The fundamental part of	is to familiarise students with the information systems topic and information systems implementation principles. During the course of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, was	ourse, students ar er types of inform lys of information	e introduced to ation systems. systems
The goal of this course on the market" existing on the fundamental part of mplementation and info	is to familiarise students with the information systems topic and information systems implementation principles. During the contypes of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, was remation system implementation based on the project management principles. The emphasis is on the initial customer analyses	ourse, students ar er types of inform ays of information sis, customer insig	re introduced to ation systems. systems ght and ability to
The goal of this course on the market" existing on the fundamental part of mplementation and infodecide whether it is better	is to familiarise students with the information systems topic and information systems implementation principles. During the control types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, was remation system implementation based on the project management principles. The emphasis is on the initial customer analyser to implement any existing information system or to develop a new one from scratch. These factors determine the information	ourse, students and er types of inform and ourselves of information sis, customer insign system implements.	e introduced to ation systems. systems that and ability to entation success
on the market" existing The fundamental part of mplementation and info decide whether it is bette At the end of the course	is to familiarise students with the information systems topic and information systems implementation principles. During the course of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, was remation system implementation based on the project management principles. The emphasis is on the initial customer analyse or to implement any existing information system or to develop a new one from scratch. These factors determine the information information systems security, operation, support, maintenance, legislation impacts, and government information systems to	ourse, students ar er types of inform nys of information sis, customer insig n system impleme pics are discusse	e introduced to ation systems. systems that and ability to entation success d.
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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.

Searching the Web and Multimedia Databases

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

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-ZRS.21 Basics of System Control

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.

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.

BI-ZUM.21 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.

BI-ZNS.21 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.
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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.

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		L	PJ
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4		L	PJ
BI-ANG	English Language, Internal Certificate Kate ina Valentová Kate ina Valentová (Gar.)	ZK	2		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 BIE-ECC course ca	n be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in E	nglish comparabl	e to or exceeding
the B2 level of the Com	mon 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.21

Name of the group: Compulsory Physical Education, version 2021

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 5)

Credits in the group: 0

Note on the group:

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

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
TV1	Physical Education	Z	0	0+2	Z	PT
TVV	Physical education	Z	0	0+2	Z,L	PT
TVV0	Physical education	Z	0	0+2	Z,L	PT
TV2	Physical Education	Z	0	0+2	L	PT
TVKLV	Physical Education Course	Z	0	7dní	L	PT

Characteristics of the courses of this group of Study Plan: Code=BI-PT.21 Name=Compulsory Physical Education, version 2021

TV1	Physical Education	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	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 BI, Version 2021

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

Credits in the group: 0

Note on the group: Guarantor: prof. lng. Róbert Lórencz, CSc., email: robert.lorencz@fit.cvut.cz

Note on the group	J. Oddrantor. prof. ing. Nobert Lore	, 000., 0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1102@111.04	ut.02
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 Marek Suchánek, Robert Pergl, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-BLE	Blender 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 David Pešek (Gar.)	KZ	4	1P+2C		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	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 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	Z	2	2C	Z,L	V
BI-EJA	Enterprise Java Jií Dan ek Jií Dan ek Jií Dan ek (Gar.)	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 David Buchtela David Buchtela (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Karel Hynek, Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský, Jan ezní ek Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	V
NI-IAM	Internet and Multimedia Ji í Melnikov	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	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	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 Jan Starý Jan Starý (Gar.)	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 Fesl Jan Fesl (Gar.)	KZ	3	1P+2C	Z	V
NI-MOP	Modern Object-Oriented Programming in Pharo Marek Skotnica, 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, Radek Hušek Dušan Knop Dušan Knop (Gar.)	KZ	5	1P+2C	L	V
NI-OLI	Linux Drivers Jaroslav Borecký, Miroslav Skrbek Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ACM	Programming Practices 1 Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
BI-ACM2	Programming Practices 2 Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	Z	V
BI-ACM3	Programming Practices 3 Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
BI-ACM4	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-AND.21	Programming for the Android Operating System Jan Mottl, Jan Vep ek, Marek Kodr Jan Mottl Marek Kodr (Gar.)	KZ	4	3C	L	V
BI-CS1	Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán (Gar.)	KZ	4	3C	L,Z	V
BI-PJV	Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
BI-KOT	Programing in Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V

NI-PSL	Programming in Scala	Z,ZK	4	2P+1C	Z	V
BI-PMA	Jií Ďan ek Ji í Dan ek Jií Dan ek (Gar.) Programming in Mathematica	Z,ZK	4	2P+2C	Z	V
BI-PHP.1	Zden k Buk Zden k Buk Zden k Buk (Gar.)	KZ		3C	Z	-
BI-PS2	Programing in PHP Programming in shell 2		4			V
	Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-PKM	Introduction to mathematics Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z	4		Z	V
NI-REV	Reverse Engineering Ji í Dostál, Josef Kokeš, Róbert Lórencz Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II 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	V
BI-ST2	Network Technology 2	Z	3	3C	L	V
BI-ST3	Alexandru Moucha Álexandru Moucha (Gar.) Network Technology 3	Z	3	2C	Z	V
BI-ST4	Alexandru Moucha Alexandru Moucha (Gar.) Network Technology 4	 	3	2C	L	V
	Alexandru Moucha Alexandru Moucha (Gar.) Scripting Languages				_	
BI-SKJ.21	Jan Ž árek, Lukáš Ba inka Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2+2	L	V
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-GIT	Version control system GIT Petr Pulc	KZ	2	16P	Z,L	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVV	Physical education	Z	0	0+2	Z,L	V
TV1	Physical Education	Z	0	0+2	Z	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2	Physical Education	Z	0	0+2	L	V
TV2K1	Physical Education 2	Z	1		L	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
BI-TS1	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 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla, Ond ej Guth Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Ond ej Suchý, 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	Z,ZK	5	2P+2C	Z	V
BI-QUA	Petr Fišer Martin Da hel Petr Fišer (Gar.) Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek	KZ	4	3C	Z	V
BI-CCN	Kodr (Gar.) Compiler Construction	Z,ZK	5	3P	L	V
BI-TEX	Christoph Kirsch Christoph Kirsch (Gar.) TeX and Typography	Z,ZK	4	2P+1C	L	V
	Petr Olšák Petr Olšák Petr Olšák (Gar.) Cultural and Social Anthropology	·				
BI-KSA	Alena Libánská, Tomáš Houdek, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká, Jan Ž árek, Dana ermáková, Petr Zemánek 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 Radek Richtr (Gar.)	ZK	4	2P+2C	Z	V
	Virtual reality I	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 Tomáš Valla Tomáš Valla (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability 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 i Chludil	KZ	3	2P+1C	L	V
BI-ZRS	Basics of System Control Kate ina Hyniová	Z,ZK	4	2P+2C	Z	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
includes both PC side	Methods of interfacing peripheral devices on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focu and peripheral devices side. Labs are practically oriented. Students gain experience with impution development, and APIs of selected devices.			Universal se		
BI-MVT.21	Modern Visualisation Technologies			Z	,ZK	5
_	e is to give an overview of modern visualization technologies and their principles, namely tect is (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with	-		-	-	
	s (e.g., SAGE and video mapping) and their applications in practice. Several rectures deal with zation, scientific data visualization, and 3D model scanning.	ii trie content crea	ation for the	mentioned te	crinologies, i	iamely fractal
TV1	Physical Education				Z	0
TVV	Physical education				Z	0
TVV0	Physical education				Z	0
TV2	Physical Education				Z	0
TVKLV	Physical Education Course				Z	0
BI-ADW.1	Windows Administration ed in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			Z	,ZK	4
BI-ALO	Algebra and Logic and deepens the study of topics touched upon in the basic course in logic.			Z	,ZK	4
BI-AVI.21	Algorithms visually			7	,ZK	4
!	nts other algorithm courses at FIT. It brings knowledge about particular important algorithms f	rom different field	ls of the con			-
	n BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization					- 1
	ing the principles of algorithms easy.	,	ŭ		· ·	0 0 .,
BI-A2L	English language, preparation for the B2 level exam				Z	2
The content of the cou	urse corresponds to the preparation for the English exam at the B2 level. Requirements for co	ourse credit. Acad	demic Achie	vement - stu	dents are du	e to: -Take an
	uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argun					
	rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). I	Requirements wil	l be specifie	d by individu	al teachers o	luring the first
class of the term.	TAR C D			1 -	714	
BI-APJ	Aplication Programming in Java			2	,ZK	4
-	ed in Czech. Advanced technologies in Java.			1	K7	
NI-AFP	Applied Functional Programming ed in Czech. Functional programming represents one of the traditional programming paradig	me Traditional a	nd noval fun		KZ	5
· ·	ed in Ozech. Functional programming represents one of the traditional programming paradig I the functional paradigm becomes an important construct of traditionally imperative languag					-
	e of a software engineer: the theory and especially the practice.	55 (OFT, O#, Jav	uj. i io outili,	mastering li	paraulyill	Societo a
BIE-ZUM	Artificial Intelligence Fundamentals			7	,ZK	4
	Artificial intelligence Fundamentals ad to the fundamental problems in the Artificial Intelligence, and the basic methods for their sc	olvina It focuses r	nainly on th	1	, i	-
Usuacino ale introduce	ed to the fulldamental problems in the Artificial intelligence, and the basic methods for their sc ment systems, game theory, planning, and machine learning. Modern soft-computing methods	-	-		313 110111 1116	areas of State

space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will

The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in 3D graphics and animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course.

Z,ZK

Z,ZK

be presented as well.

This course is presented in Czech.

Blender

Database Systems in Practes

BI-BLE

BI-STO	Storage and Filesystems	Z,ZK	4
•	inciples and current solutions of storage systems architecture. The module explains principles of data store, protection, and ar	rchiving, as so as	storage scaling,
load balancing and high	·	1/7	4
NI-PSD	Public Services Design e students to specifics of UX, Service design and development for public sector. We will look into the design and development	KZ	4
	ignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	=	· · ·
	ents-designers as well as clients.		
NI-DZO	Digital Image Processing	Z,ZK	4
This course presents a	comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical a	algorithms that are	e both easy to
•	interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is		
	ing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR		- 1
	raction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray co ossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		
NI-DDM	Distributed Data Mining	KZ	4
	postributed Data Milling. e-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand		
	ork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations		-
	e other algorithms. The course is prezented in czech language.		
BI-EP1.24	Effective programming 1	KZ	4
The course is taught in	Czech.		
BI-EP2	Efficient Programming 2	KZ	4
	Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indi	vidual problems a	are discussed,
	he best one and avoid implementation errors.		
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
	se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
	ate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by i		
class of the term.			g
BI-EJA	Enterprise Java	Z,ZK	4
The course is on advan	ced technologies in the Java programming language. The focus is on technologies for development of enterprise information		e connected to
a database and are acc	essed through the web interface.		
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
	ced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise inform	mation systems w	ith microservice
architecture, that can be		7 71/	
BI-FMU	Financial and Management Accounting sexplanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the	Z,ZK	5
	and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modifica	-	1
•	based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of managing	•	
Business Inteligence mo	oduls in Business information systems.		
BI-HAM	HW accelerated network traffic monitoring	KZ	4
	students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. T	_	-
	datory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a		
. , .	of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network tr ir practical abilities in this field.	arric on a nardwa	are and software
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is presented		۷,۷۱۲	5
BI-ARD	Interactive applications on Arduino	KZ	4
	for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple appli		n programmable
kits and control varied p	eripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded	systems, i.e. to s	see the results
	PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	e is suitable even	for Web and
Software Engineering st			
NI-IAM	Internet and Multimedia	Z,ZK	4
	cused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes ac als (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic	•	
	ns. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the ϵ		
	of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording		· .
for audience.			
BIE-CSI	Introduction to Computer Science	Z	2
	lass on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other		
-	idents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	-	
	es of computer science for students to understand, early on, what computer science is, why things such as high-level prograi and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer i		
	tions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inte	=	•
than expected, or even		,	
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and ex	tend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they ar	re able to apply th	nem in particular
examples.			
BI-CS2	C# language and data access	KZ	4
	ata access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micr	-	
-	d to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current tec and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL	-	
	her objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data	-	
·	course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mo		
(XML description).			

BI-CS3 Language C# - design of web applications The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of		
The students will be introduced to current technologies in web application development on the NET platform. They will acquire a comprehensive overview of	KZ	4
on thisplatform. They will learn to create WebAPI and to use it by client programs.	the developm	nent possibilities
BI-SQL.1 Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In part		program unites,
triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of	•	
structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and p will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle D		_
PostgreSQL.	DIVIO AND PA	il tially Off
BI-QAP Quantum algorithms and programming	KZ	5
Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on	-	_
are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developments of PLAA2 or PLAA2 or PLAA2 or PLAAA or PLAAA or PLAAA or PLAAA or PLAAA		
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 ar might be an advantage. No previous knowledge of physics is assumed.	па ехрепенс	e with Python
NI-LSM Statistical Modelling Lab	KZ	5
The subject is oriented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is put or	on the effective	ve use of the
available information and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and a	analyses of th	neir properties.
At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis). 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. S	· .	-
use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
NI-MPL Managerial Psychology	ZK	2
· ·	Z,ZK	4
Mathematical semantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott mod	del of lambda	calculus.
Introduction to category theory. BI-MIT Mikrotik technologies	KZ	3
The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are comm		_
middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the meta		
and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer networks and practically deploy them.	works concep	ots like protocols
and technologies of the data-link, network and transport layer of the OSI model.	1/7	4
NI-MOP Modern Object-Oriented Programming in Pharo Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where its	KZ	•
is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills of	-	
of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development need	ds and areas	of interest. In
addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work on		-
technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvement BI-MMP Multimedia team project	KZ	4
This course is presented in Czech.	IXZ	4
BI-ORL Operations Research and Linear Programming	KZ	5
The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundame	•	ation technique.
Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as manage		4
NI-OLI Linux Drivers The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining pow	Z,ZK	4 ors and FPGAs
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development for	· ·	
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience.		
BI-ACM Programming Practices 1	KZ	5
This course is presented in Czech.	1/7	
BI-ACM2 Programming Practices 2 This course is presented in Czech.	KZ	5
	KZ	5
BI-ACM3 Programming Practices 3	ı	
BI-ACM3 Programming Practices 3 This course is presented in Czech.		
This course is presented in Czech. BI-ACM4 Programming Practices 4	KZ	5
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech.		
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System	KZ KZ	5 4
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech.		
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental constitutions.	KZ KZ struction, typ	4 es of variables,
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition	KZ KZ struction, typon and class in	4 es of variables,
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and	KZ KZ struction, typon and class in	4 es of variables,
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and well as work with files are emphasized.	KZ KZ struction, typ on and class ind exception	4 es of variables,
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and well as work with files are emphasized.	KZ KZ struction, typon and class in	4 es of variables, instancing, processing, as
This course is presented in Czech. BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging arwell as work with files are emphasized. BI-PJV Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-PJS.1 JavaScript Programming	KZ KZ struction, typ on and class ind exception Z,ZK KZ	4 es of variables, instancing, processing, as 4
BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging arwell as work with files are emphasized. BI-PJV Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-PJS.1 JavaScript Programming Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Java	KZ KZ struction, typ on and class in d exception Z,ZK KZ avascript. Th	4 es of variables, instancing, processing, as 4 4 e course is
BI-ACM4 Programming Practices 4 This course is presented in Czech. BI-AND.21 Programming for the Android Operating System This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental consoperators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging are well as work with files are emphasized. BI-PJV Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-PJS.1 JavaScript Programming Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Java recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this	KZ KZ struction, typ on and class in d exception Z,ZK KZ avascript. Th	4 es of variables, instancing, processing, as 4 4 e course is
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NI-PSL	Programming in Scala	Z,ZK	4
	tes the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language fea		-
Scalaz, etc.	prary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful framework	s and libraries e.g. i	Play, Cassandra,
BI-PMA	Programming in Mathematica	Z,ZK	4
	rking with modern technical and scientific software. Students will learn how to use different programming styles (functional progr	1 '	•
	dynamic interactive applications and visualisations, data processing and presentations.	3, 1 1 1 1 1 1	3,
BI-PHP.1	Programing in PHP	KZ	4
The course is taugh	t in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices	and will use tool t	hat eases
•	P. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to registe	er for BIE-TWA.1. TI	ney should
	rse in their 3rd semester of study.		
BI-PS2	Programming in shell 2	Z,ZK	4
	neral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In an other particular scripting languages and will get practical experience with shell script programming.	ddition, they gain a	deeper insight
NI-PDD	Data Preprocessing	Z,ZK	5
	epare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various d		-
	d learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of charact		
pages.			
BI-PKM	Introduction to mathematics	Z	4
This course is prese	ented in Czech.	•	
NI-REV	Reverse Engineering	Z,ZK	5
Students will get ac	quainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens	s before and after t	he main function
	vill understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is de		
	in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be		-
• • • • • • • • • • • • • • • • • • • •	ugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compu- seminars, where students will solve practically oriented tasks from the real world.	uter maiware scene	. THE TOCUS OF
BI-SCE1	Computer Engineering Seminar I	Z	4
	nputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistar	_	•
	ividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of		
• •	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	•	
semester.			
BI-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Con	nputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistar	nce to failures and a	attacks. Students
• • •	ividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part ol	f the subject is wor	k with scientific
articles and other p		•	
•	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	•	
semester.		achers. The topics	are new for each
semester. BI-ST1	Network Technology 1	achers. The topics	are new for each
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semester. BI-ST1 The subject is orien CCNA1 - R&S	Network Technology 1 ted to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredi	Z ited under the Cisc	are new for each 3 o Netacad -
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BI-TS1 Theoretical Seminar I	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	0.0	
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	s a work with scien	tific papers and
BI-TS2 Theoretical Seminar II	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	1	p. 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	s a work with scien	tific papers and
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS3 Theoretical Seminar III	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS4 Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is	s a work with scien	tific papers and
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TDA Test driven architecture	KZ	4
The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a	į.	•
world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur i		
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 provide the students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to provide the students will gain knowledge about circuit testing and about methods for increasing reliability and security.	•	
the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with will be able to compute, analyze, and control the reliability and availability of the designed circuits.	built-in-self-test e	quipment. They
BI-QUA Quality Assurance	KZ	4
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		-
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student sho		
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		
BI-CCN Compiler Construction	Z,ZK	5
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles understand the design 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
This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of t	, I	•
rules.		,, , ,
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 dive	reity of the world -	overmoles from
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anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	-	
· · · · · · · · · · · · · · · · · · ·	-	
anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he shown. The course is presented in Czech.	ealth, history, death	n, etc) will be
anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he shown. The course is presented in Czech. BI-ULI Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).	ealth, history, death Z e familiar with bas	n, etc) will be
anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he shown. The course is presented in Czech. BI-ULI Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). BI-OPT Introduction to Optical Networks	zalth, history, death Z e familiar with bas Z,ZK	2 ic commands
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BI-VMM Selected Mathematical Methods We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail. NI-VYC Z,ZK Computability 4 Classical theory of recursive functions and effective computability. BI-7S10 Bachelor internship abroad for 10 credits Z 10 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Bachelor internship abroad for 20 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS30 Bachelor internship abroad for 30 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. ΚZ 4 BI-ZIVS Intelligent Embedded System Fundamentals Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise **BI-ZNF** PHP Framework Nette - basics 3 ΚZ Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. Basics of System Control Z.ZK 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-IOS** Fundamentals of iOS Application Development for iPhone and iPad ΚZ 4 This course is presented in Czech BI-ZWU Introduction to Web and User Interfaces Z,ZK 4 This course is presented in Czech. BI-3DT.1 3D Printing ΚZ 4

Code of the group: BI-V-PRO MG

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

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

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

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Completion Credits Code Semester Scope Role members) Tutors, authors and guarantors (gar.) Algorithms and Graphs 2 BI-AG2 Z,ZK 2P+2C L Ond ej Suchý

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

BI-AG2 Algorithms and Graphs 2 Z,ZK

This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1. It further delves into 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.

List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
active part in the	English language, preparation for the B2 level exam 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 th ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indir	e midterm and the	e final term
	class of the term.		-
	Automata and Grammars duced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite anars, 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 course is presented in Czech.	KZ	5
BI-ACM2	Programming Practices 2 This course is presented in Czech.	KZ	5
BI-ACM3	Programming Practices 3 This course is presented in Czech.	KZ	5
BI-ACM4	Programming Practices 4 This course is presented in Czech.	KZ	5
BI-ADU.21	Unix Administration	Z,ZK	5
between user and a processes, memo	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 known specific examples from practice. Windows Administration	ile systems, disk s wledge from the l	subsystems
BI-ADW.1	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
develops the know	Algorithms and Graphs 1 It is the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curveledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the partition or the course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics are provided in the course also follows up knowledge from BI-MA1.21.	time and space co	
BI-AG2.21 This course, pres	nted in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory of a structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English versice Algorithms and Graphs 2 sented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory inces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English control of the compulsory in the c	on of the course se Z,ZK course BI-AG1.2°	ee BIE-AG2 5 1. It further
BI-ALO	BIE-AG2.21. 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	2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK The content of the active part in the	English language, contact preparation for the B2 level exam 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 indirections.	Z students are due e midterm and the	2 to: -Take are final term
BI-APJ	class of the term. Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
pipelined instructio not only in scala	Architectures of Computer Systems In the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Specing processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principle processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of see further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence.	iples of instruction the sequential mo	n processing odel of the
kits and control va	Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple application aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded stay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students.	stems, i.e. to see	the results

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 ions like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing		
,	knowledge of security applications in computer networks.	-	J
BI-AVI.21	Algorithms visually	Z,ZK	4
-	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&l that make understanding the principles of algorithms easy.	t;http://www.algovis	sion.org>)
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
	equainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and because of the configure of the configuration of the configure of the configuration of the config		_
web serv	ice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam	iple of a web serve	er.
BI-BAP.21	Bachelor Thesis	Z	14
BI-BEK.21	Secure Code	Z,ZK	5
	arn 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 gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		_
	leges. 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
	roduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is for		
-	e students were able to choose suitable tools (mostly open source) and techniques,design and implement a simplest reproducible me 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.		
BI-BLE	Blender	Z,ZK	4
	ds knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those in	•	•
	offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph	nics applications) o	
BI-BPR.21	Bachelor project g of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the	∣ ∠ nartial tasks that h	1 e / she will
	semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at the		
·	enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut		
· · · · · · · · · · · · · · · · · · ·	and signed form will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 3. If the student will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 3. If the student will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 3. If the student will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 3. If the student will be handed over by the student to the head of the Department of Defense, who will record the credit in KOS. 3. If the student will be handed over by the student will be handed	-	
student has reserv	ved is formulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tunir assignment can be supplemented and approved at the end of the semester.	ig the assignment	so that the
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	,	_
understa	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the clas-	1
BI-CS1	Programming in C#	KZ	4
•	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		
	ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging		_
	well as work with files are emphasized.		
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 is used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current techr	•	
-	rying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (L	-	
•). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data u	•	
(ORM). This part of	f the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model	, Storage Model a	nd Mapping
BI-CS3	(XML description).	V7	1
	Language C# - design of web applications sintroduced to current technologies in web application development on the .NET platform.They will acquire a comprehensive overview of	KZ of the development	possibilities
The stage in Se	on thisplatform. They will learn to create WebAPI and to use it by client programs.	, and development	. poooio
BI-DBS.21	Database Systems	Z,ZK	5
	oduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They lear	_	
	constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the lation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the funda		
	lling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced t	•	
in relational databa	ases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of data	oase systems, deb	ugging and
	optimizing database applications, distributed database systems, data stores.		ı
BI-DML.21	Discrete Mathematics and Logic	Z,ZK	5
	equainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The cours		-
oposiai attorition is	combinatorics and number theory, with emphasis on modular arithmetics.	o aloo layo down t	110 540100 01
BI-EHA.21	Ethical Hacking	Z,ZK	5
	ourse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln		-
exploitation in com	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.	on hands-on expe	erience with
BI-EJA	Enterprise Java	Z,ZK	4
	dvanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sys		
	a database and are accessed through the web interface.		
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
The course is on ac	dvanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise informat	ion systems with n	nicroservice
	architecture, that can be deployed to the cloud.		

	Effective programming 1 The course is taught in Czech.	KZ	4
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Et	fficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individ with the aim to choose the best one and avoid implementation errors.	ual problems are	discusse
BI-EPP.21	Economic Business Processes	Z,ZK	5
	rse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and		
	ronment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the c		
stablishment of th	ne company, through the management of property and capital structure, financing of the company, determining the cost function of the	company and la	bor costs,
DI EDI 04	evaluating the financial health of the company and its eventual rehabilitation or termination.	7 71/	5
BI-FBI.21	Financial Business Intelligence rse is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business a	Z,ZK	1
	ise is to acquaint students primarily with infancial accounting as a tool for recording business operations and documents for business a state of the faction of the second view is management decision process at the tactical and strategic level. The second view is management decision process at the tactical and strategic level. The second view is management decision process at the tactical and strategic level. The second view is management decision process at the tactical and strategic level. The second view is management decision process at the tactical and strategic level.	•	•
	ement and prediction of business development. Management accounting allows monitoring of the financial status and performance of b	_	-
-	ds, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and		
assess options re	lated to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intel	ligence modules	in busines
	information systems, decision support systems, and other knowledge-oriented systems.		
BI-FEM.21	Fundamentals of Economics	Z,ZK	5
he course allows	the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. If	contains a gene	ral overvi
	of fundamental microeconomic and macroeconomic topics.		_
BI-FMU	Financial and Management Accounting	Z,ZK	5
	rse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the par unts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification		
•	unts and accounting statements including opening and closing of bookkeeping. The codise provides students with a legal modification rations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of managen		-
or coorionnic oper	Business Intelligence moduls in Business information systems.	ioni accounting t	are base (
BI-GIT	Version control system GIT	KZ	2
	troduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practic		1
	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s		-
BI-GIT.21	SW Development Technologies	Z	3
his course is aime	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to	Git, the informat	ion mana
	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	KZ	4
	duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The	_	-
	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a so		
or analysis). The g	pals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network trafficularies in this field.	on a naroware a	and Sonwa
BI-HAS	Human Aspects in Cryptography and Security	Z.ZK	5
_	students interested not only in technical scope of computer science, but also in making products usable - for users and for developers	,	_
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	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		1
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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-KOT** Programing in Kotlin Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advanced language constructions. The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a modern, object-functional way with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages) Cultural and Social Anthropology The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, health, history, death, etc ...) will be shown. The course is presented in Czech. BI-LA1.21 Linear Algebra 1 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. Linear Algebra 2 BI-LA2.21 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 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 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 Newton's 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 Landau's 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 Taylor's 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. Modern Data Formats 3 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 5 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 3 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 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. BI-ML2.21 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-MMP Multimedia team project ΚZ 4 This course is presented in Czech. BI-MPP21 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. Modern Visualisation Technologies 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.

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BI-OOP.21	Object-Oriented Programming	Z,ZK	5
, ,	rogramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphasized for developing software, which includes testing, error handing, refactoring, and application of design pattern.	, , ,	١
BI-OPT	Introduction to Optical Networks	Z,ZK	4
_	overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possi	· .	
-	technology and on their solutions. The course will include the history of optical communications, an overview of passive components	· · · · · ·	
-	sators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system		- 1
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. S from practice.	Students will solve	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 fundam The research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (sucl	· ·	
BI-OSY.21	Operating Systems	Z,ZK	5
	a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp		
critical regions, thre	ad scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monit and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Wi		le to design
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, struc ons, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchin with linked lists and trees.		-
BI-PA2.21	Programming and Algorithmics 2	Z,ZK	7
	nstruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	_	- 1
table). They lear	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e copying/moving of objects, operator overloading, inheritance, polymorphism).	.g., template progr	amming,
BI-PAI.21	Law and Informatics	ZK	5
The aim of the co	irse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of	doing business in	the Czech
· ·	ll be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding co		
	now their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to use and a set as it as a factor of the second section of the section of the second section of the section of the second section of the sec		
•	censes. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection a ted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses o	•	
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
_	ent the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their u		_
data (3D scenes, n	nathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using buby implementation of plugins.	uilt-in scripting land	guages and
BI-PGR.21	Computer graphics programming	Z,ZK	5
After attending this	curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the	scene, add textur	es imitating
geometric details a	nd materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terr	ms used in comput	er graphics,
	ipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing	_	
	oment, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfac		
BI-PHP.1	Programing in PHP ught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a	KZ	4
	ognith occurse is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for		
	register for this course in their 3rd semester of study.		,
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	sic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers GN		- 1
create a specificat	on 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. The	ha aamailar aan tr	anslate not
		ne compiler can tra	
DI DIC 4	only a programming language but any text in a language generated by a given LL input grammar.		
BI-PJS.1	JavaScript Programming	KZ	4
Main goal of the		KZ in Javascript. The	4 course is
Main goal of the	JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development	KZ in Javascript. The	4 course is
Main goal of the	JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents 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	KZ in Javascript. The	4 course is
Main goal of the recommended for s	JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents 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.	KZ in Javascript. The is course in their 4	4 course is th semester
Main goal of the recommended for s	JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents 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	KZ in Javascript. The is course in their 4	4 course is th semester
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Main goal of the recommended for s BI-PJS.21 The course is ar BI-PJV BI-PKM	JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents 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 introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code development to 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.	KZ in Javascript. The is course in their 4 KZ apment in Javascrip Z,ZK	4 course is th semester 5 ot easier. 4
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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, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects. BI-PRS.21 ΚZ Practical Statistics 5 The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose models fitting the data. The course will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software R and will apply the studied methods on data from real problems. BI-PS2 Programming in shell 2 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-PSI.21 Computer Networks Z,ZK 5 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 5 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. 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. ΚZ **BI-QAP** Quantum algorithms and programming 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. **BI-QUA Quality Assurance** ΚZ 4 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. BI-SAP.21 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 7 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-SCE2 Computer Engineering Seminar II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. **Network Programming** 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 Z,ZK 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 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 ΚZ Team Software Project 1 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. Team Software Project 2 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			
DI 01 0.21	Administration of Computer Networks and Services	Z,ZK	5
The aim of the coul	se is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrate	d under the operat	ing systems
	. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by		
	with real network infrastructure.		
51.001.4			
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based on	knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa	articular stored pro	gram unites,
triggers, recursive of	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of	of view of specialize	ed database
structures like inde	exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan ar	nd possibilities of it	s changes
		•	_
will be discusse	d. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS.	acie Doivio ariu pa	rually off
	PostgreSQL.		
BI-SRC.21	Real-time systems	Z,ZK	5
Students obtain th	ne basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues	. Theoretical knowl	edge from
lectures will be exp	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are	e the same as in th	ne BIE-VES
	course.		
51.071		_	
BI-ST1	Network Technology 1	Z	3
The subject is or	iented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited	d under the Cisco	Netacad -
	CCNA1 - R&S Introduction to Networks.		
BI-ST2	Network Technology 2	Z	3
DI-012	•	_	5
	This course is presented in Czech.	1	
BI-ST3	Network Technology 3	Z	3
Students will furthe	r enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during E	BI-ST1 and BI-ST2	courses will
	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predi		
3-1.0.1.01 OMOIN	simple topology, security, etc.	,, 001101011	, u
D: 07:		_	_
BI-ST4	Network Technology 4	Z	3
Students will further	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	presented during I	BI-ST1 and
BI-ST2 courses go	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici	ency, predictability	extension
_	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		
-			•
recoveries, and en	nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation	on ways while mair	ntaining the
	network running.		
BI-STO	Storage and Filesystems	Z,ZK	4
	rn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi		ı ane scaling
THE Stadent Will loa		iving, ao oo ao olor	ago ocamig,
	load balancing and high availability.		
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
Camera systems a	are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in	mage information.	The course
IIIII Oddoes siddeiiis	s to different types of camera systems and a variety of methods for image and video processing. The course is locused on practical use	of camera system	s for solving
introduces students	s 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 system	s for solving
	problems of practice that the graduates may encounter.		_
BI-SWI.21	problems of practice that the graduates may encounter. Software Engineering	Z,ZK	5
BI-SWI.21 Students get acqua	problems of practice that the graduates may encounter. Software Engineering ainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They co	Z,ZK nsolidate and prac	5 tically verify
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BI-TS2 Theoretical Seminar II 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-TS3 Ζ Theoretical Seminar III 4 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV 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 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 Z,ZK 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 Z,ZK 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. 2 BI-ULI Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal) BI-UOS.21 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 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 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 Z,ZK 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** Z,ZK 5 Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. **BI-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 Z,ZK We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail. BI-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 ΚZ 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 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). Intelligent Embedded System Fundamentals Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. BI-ZNF ΚZ 3 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 popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. 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. Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. Basics of System Control BI-7RS Z,ZK 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-ZRS.21 **Basics of System Control** 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-ZS10 Bachelor internship abroad for 10 credits 7 10 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Bachelor internship abroad for 20 credits Ζ 20 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship, Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS, Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. Bachelor internship abroad for 30 credits BI-ZS30 7 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. 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. BI-ZUM.21 Artificial Intelligence Fundamentals Z,ZK 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. **BI-ZWU** Introduction to Web and User Interfaces This course is presented in Czech.

BIE-CSI	Introduction to Computer Science ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie	Z	2
	of 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 programm		
	are, 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 interes	ted in computer so	cience more
BIE-EEC	than expected, or even less than before. English language external certificate	Z	4
	e can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English		
	the B2 level of the Common European Framework of Reference for Languages.	,	
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh ar	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	ble to apply them	in particular
DIE 050	examples.		
BIE-SEG	Systems Engineering ory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of c	Z	0 for atudanta
	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking		
="	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor		
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical		
space search, multi	 -agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm be presented as well. 	s and the neural ne	etworks, will
NI-AFP	Applied Functional Programming	KZ	5
I	ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional p		
· ·	and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master		-
 	necessary competence of a software engineer: the theory and especially the practice.		
NI-DDM	Distributed Data Mining	KZ	4
	state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of	-	-
data processing ira	amework 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.	nd will be capable	to propose
NI-DSP	Database Systems in Practes	Z,ZK	4
111 201	This course is presented in Czech.	2,21	•
NI-DZO	Digital Image Processing	Z,ZK	4
This course presen	nts a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg	orithms that are bo	oth easy to
-	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also		
	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conv	-	-
	gid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		
NI-IAM	Internet and Multimedia	Z,ZK	4
The NI-IAM cours	e is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq	uisition of AV signa	als (input),
•	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical u		
	nissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effor The normal structure of transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the	-	
the quality and later	for audience.	e scerie up to trie p	resentation
NI-LSM	Statistical Modelling Lab	KZ	5
	ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p		-
available information	on and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and	-	properties.
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesi	·	
NI-MOP	Modern Object-Oriented Programming in Pharo gramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where	KZ	4
	plex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills		
	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development no		
addition to deepeni	ng object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of	n interesting proje	cts and OO
	ms of 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
Mathematical se	mantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott Introduction to category theory.	model of lambda	caiculus.
NI-OLI	Linux Drivers	Z,ZK	4
	system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po		
increase the varia	ability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development	nt for master's stud	ents. The
	urse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practice		
NI-PDD	Data Preprocessing	Z,ZK	5
•	repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris		• •
ume senes, etc., a	ind learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris pages.	ilos iroiti iitiages 0	i iioiii web
NI-PSD	Public Services Design	KZ	4
	oduce students to specifics of UX, Service design and development for public sector. We will look into the design and development produce students to specifics of UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and development produce students to specific soft UX, Service design and Service students to specific soft UX, Service design and Service students to specific soft UX, Service students to specific sof		
suppliers (devs a	nd designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	with client repres	entatives.
	Course is aimed at students-designers as well as clients.		

NI-PSL	Programming in Scala	Z,ZK	4
The course introd	luces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature	es - e.g.pattern m	atching and
advance standard	library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and	l libraries e.g. Play	, Cassandra,
	Scalaz, etc.		
NI-REV	Reverse Engineering	Z,ZK	5
Students will get a	equainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before	ore and after the n	nain function
is called. Students	s will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedica	ated to reverse en	gineering of
	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be do	•	•
debuggers and d	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.		_
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 s	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
_	in knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	-	-
•	irtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie		•
	arameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti	٠.	•
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_
TVKLV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
		•	•

For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2024-05-19, time 04:58.