Study plan

Name of study plan: Bachelor Specialization Computer Systems and Virtualization, in Czech, 2021

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch: Program of study: Informatika Type of study: Bachelor full-time

Required credits: 153

Elective courses credits: 27 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. Ing. Pavel

Tvrdík, CSc., email:pavel.tvrdik@fit.cvut.cz

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 106

The role of the block: PP

Code of the group: BI-PP.21

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

2021

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

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

Credits in the group: 106

Note on the group:

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

	Name of the course / Name of the group of courses					
Code	(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 Tomáš Valla, Michal Opler, Dušan Knop, Ond ej Suchý, Ond ej Šofr, Radek Hušek, Jan Volec Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	z	PP
BI-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BI-BPR.21	Bachelor project Zden k Muziká Zden k Muziká (Gar.)	Z	1	0P+0C	Z,L	PP
BI-DBS.21	Database Systems Martin Urbanec, Ond ej Rozinek, Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, Pavel K íž, Št pán Pechman, Ji í Hunka Michal Valenta (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Daniel Dombek, Jan Sp vák, Jan Legerský Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, 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 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-MA2.21	Mathematical Analysis 2 Pavel Hrabák, Tomáš Kalvoda, Eva Pernecká, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BI-OSY.21	Operating Systems Ji í Kašpar, Michal Štepanovský, Jan Trdli ka, Petr Zemánek, Pavel Tvrdík, Ladislav Vagner Pavel Tvrdík Michal Štepanovský (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI.21	Computer Networks Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, Josef Koumar, Petr Hoda, Josef Zápotocký, Michal Polák, Jan Fesl Jan Fesl (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-PST.21	Probability and Statistics Kamil Dedecius, Pavel Hrabák, Jitka Hrabáková, Petr Novák, Jana Vacková Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-PA1.21	Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Miroslav Balík, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BI-PA2.21	Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP.21	Computer Structure and Architecture Hana Kubátová, Jaroslav Borecký, Petr Fišer, Martin Kohlík Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BI-TZP.21	Technological Fundamentals of Computers Jan ezní ek, Jaroslav Borecký, Robert Hülle, Martin Kohlík, Vojt ch Miškovský, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-GIT.21	SW Development Technologies Petr Pulc, Robin Ob rka Robin Ob rka Petr Pulc (Gar.)	Z	3	2P	Z	PP
BI-TDP.21	Documentation and Presentation Petra Pavlí ková, Dana Vynikarová, Alena Libánská, Tomáš Nová ek Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BI-UOS.21	Unix-like Operating Systems Zden k Muziká, Viktor erný, Michal Hažlinský, Jakub Jan i ka, Miroslav Prágl, Michal Šoch, Jan Trdli ka, Yelena Trofimova, Petr Zemánek, Zden k Muziká Zden k Muziká (Gar.)	KZ	5	2P+2C	Z	PP

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

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

BI-AAG.21 Automata and Grammars 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 must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the topic of the work that the student has reserved is formulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assignment so that the assignment can be supplemented and approved at the end of the semester.

BI-DBS.21 Database Systems Z,ZK 5

Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores.

BI-DML.21 Discrete Mathematics and Logic

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

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

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

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

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

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

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

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.

Name of the block: Compulsory courses in the specialization

Minimal number of credits of the block: 40

The role of the block: PS

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

Name of the group: Compulsory Courses of Specialization Computer Systems and Virtualization, version

2021

Requirement credits in the group: In this group you have to gain 40 credits

Requirement courses in the group: In this group you have to complete 8 courses

Credits in the group: 40 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADU.21	Unix Administration Zden k Muziká , Miroslav Prágl, Petr Zemánek Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	PS
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	PS
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-SPS.21	Administration of Computer Networks and Services Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	PS
BI-IDO.21	Introduction to DevOps Michal Valenta, Ji í Mlejnek, Tomáš Vondra, Zden k Rybola, Št pán Pechman, Tomáš Klas, Miroslav Štaffa, Martin Mareš Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	PS
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	PS
BI-ZSB.21	Basics of System Security Marián Svetlík, Dominik Novák, Ladislav Marko, Martin Šutovský Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	PS

Characteristics of the courses of this group of Study Plan: Code=BI-PS-PV.21 Name=Compulsory Courses of Specialization Computer Systems and Virtualization, version 2021

Unix Administration BI-ADU.21 Z,ZK Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They will understand the differences between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, file systems, disk subsystems, processes, memory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the knowledge from the lectures on specific examples from practice.

BI-AWD.21 Web and Database Server Administration

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

BI-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-SPS.21 Administration of Computer Networks and Services

The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated under the operating systems Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by practical hands-on experience with real network infrastructure.

Introduction to DevOps

The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systems and services. The course covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and building and deploying software to the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquainted with modern technologies used in practice.

BI-VDC.21 Virtualization and Data Centers

The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.

BI-VPS 21 Selected Topics in Computer Networking

Z,ZK

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

BI-ZSB.21 Basics of System Security

7 7K

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.

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 5

The role of the block: PV

Code of the group: BI-PV-PV.21

Name of the group: Compulsory elective Courses of Specialization Computer Systems and Virtualization,

version 2021

Requirement credits in the group: In this group you have to gain at least 5 credits (at most 20)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 4)

Credits in the group: 5 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	PV
FIT-ITI	Modern IT infrastructure Ivan Šime ek, Tomáš Vondra, Jan Fesl Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	Z,L	PV
BI-TAB.21	Applications of Security in Technology Ji í Dostál, Jan B lohoubek, Martin Kolárik, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	PV
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=BI-PV-PV.21 Name=Compulsory elective Courses of Specialization Computer Systems and Virtualization, version 2021

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.

FIT-ITI Modern IT infrastructure

Z,ZK

5

with a very limited and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A modern data or computing center is understood here as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies. The proposed solution should thus be capable of continuous and economically optimal operation.

BI-TAB.21 Applications of Security in Technology

Z,ZK

5

The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.

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.

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 7)

Credits in the group: 0

Note on the group:

The student is obliged to successfully complete two courses of this group.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
TVK1	Physical Education Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,Z	PT
TVV	Physical education	Z	0	0+2	Z,L	PT
TV1	Physical Education	Z	0	0+2	Z	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
TVKZV	Physical Education Course	Z	0	7dní	Z	PT

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

TVK1	Physical Education	Z	1
TVV	Physical education	Z	0
TV1	Physical Education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

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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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 be recognized for the course BI-ANGS (Independent preparation for the English exam) for 2 credits.

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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	2D	L	PJ
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PJ
BI-ANG	English Language, Internal Certificate Kate ina Valentová Kate ina Valentová (Gar.)	ZK	2	2D	Z,L	PJ

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

	0 1 7					
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2			
BIE-EEC	English language external certificate	Z	4			
The BIE-ECC course ca	The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable 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: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BI-V.2021

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

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

Credits in the group: 0
Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
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	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V

BI-BLE	Blender	Z,ZK	4	2P+2C	L	V
NI-DSP	Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.) Database Systems in Practes	Z,ZK	4	2P+1C	L	V
BI-STO	Tomáš Vichta Tomáš Vichta Tomáš Vichta (Gar.) Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
BI-DAS	Data Structures	Z,ZK	5	2P+1C	L	V
NI-PSD	Michal Opler, Radek Hušek Michal Opler Michal Opler (Gar.) Public Services Design	KZ	4	1P+2C		V
BIF-DIF	David Pešek, Ond ej Brém, Jan Ladin David Pešek Ond ej Brém (Gar.) Differential equations	Z,ZK	5	2P+2C	L	V
NI-DZO	Tomáš Kalvoda Digital Image Processing	Z,ZK	4	2P+1C		V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1	KZ	4	2P+2C	Z	V
BI-EP2	Martin Ka er Martin Ka er Martin Ka er (Gar.) Efficient Programming 2	KZ	4	2P+2C	L	V
BI-ANGK	Martin Ka er Martin Ka er Martin Ka er (Gar.) English language, contact preparation for the B2 level exam	Z	2	2C	Z,L	V
BI-EJA	Kate ina Valentová Kate ina Valentová Kate ina Valentová (Gar.) Enterprise Java	Z,ZK	4	2P+2C		V
BI-EJK	Ji í Ďan ek Enterprise Java and Kotlin			2P+2C		-
-	Jií Dan ek	Z,ZK	4		L	V
BI-FMU	Financial and Management Accounting David Buchtela	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Jan ezní ek, Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský Robert Hülle Robert Hülle (Gar.)	KZ	4	3С	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
FITE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BI-CS2	C# language and data access	KZ	4	0P+3C	Z	V
BI-CS3	Pavel Št pán Pavel Št pán Pavel Št pán (Gar.) Language C# - design of web applications	KZ	4	3C	Z	V
BI-SQL.1	Pavel Št pán Pavel Št pán Pavel Št pán (Gar.) Language SQL, advanced	KZ	4	3C	L	V
BI-QAP	Michal Valenta Michal Valenta Michal Valenta (Gar.) Quantum algorithms and programming	KZ	5	1P+2C	Z	V
NI-LSM	Tomáš Kalvoda, Ivo Petr Ivo Petr Ivo Petr (Gar.) Statistical Modelling Lab	KZ	5	3C		V
_	Kamil Dedecius Kamil Dedecius (Gar.) Human Aspects in Cryptography and Security					-
BI-HAS	Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPL	Managerial Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.)	ZK	2	2P	Z,L	V
NI-MSI	Mathematical Structures in Computer Science Jan Starý	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 Fesi Jan Fesi (Gar.)	KZ	3	1P+2C	Z	V
NI-MOP	Modern Object-Oriented Programming in Pharo Jan Blizni enko Robert Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Operations Research and Linear Programming	KZ	5	1P+2C	L	V
NI-OLI	Dušan Knop Dušan Knop Dušan Knop (Gar.) Linux Drivers	Z,ZK	4	2P+2C	L	V
BI-ACM	Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.) Programming Practices 1	KZ	5	4C		V
FIT-ACM1	Tomáš Valla Programming Practices 1	KZ	5	4C	 L	V
I II-AOIVI I	Tomáš Valla Tomáš Valla (Gar.)	Γ\L		40		v

FIT-ACM2	Programming Practices 2	KZ	5	4C	Z	V
BI-ACM2	Tomáš Valla Ond ej Suchý (Gar.) Programming Practices 2 Tomáš Valla	KZ	5	4C	Z	V
FIT-ACM3	Programming Practices 3 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
BI-ACM3	Programming Practices 3	KZ	5	4C	L	V
FIT-ACM4	Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) Programming Practices 4	KZ	5	4C	Z	V
BI-ACM4	Ond ej Suchý Ond ej Suchý (Gar.) Programming Practices 4	KZ	5	4C	Z	V
FIT-ACM5	Tomáš Valla Ond ej Suchý (Gar.) Programming Practices 5	KZ	5	4C	L	V
FIT-ACM6	Ond ej Suchy Ond ej Suchý (Gar.) Programming Practices 6	KZ	5	4C	 L	V
	Ond ej Suchy Ond ej Suchy (Gar.) Programming for the Android Operating System	KZ	4	3C	L	
BI-AND.21	Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C#		4	30	L	V
BI-CS1	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 Tomáš Chvosta Tomáš Chvosta (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala Ji í Dan ek	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing 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 Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I 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 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3	Z	3	2C	Z	V
BI-ST4	Alexandru Moucha Alexandru Moucha (Gar.) Network Technology 4	Z	3	2C	L	V
BI-SKJ.21	Alexandru Moucha Alexandru Moucha (Gar.) Scripting Languages	Z,ZK	4	2+2	L	V
BI-SOJ	Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.) Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
FIT-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business	Z,ZK	4	2P+2C	L	V
NI-SYP	Tomáš Evan Tomáš Evan (Gar.) 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
TVK1	Physical Education Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,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,Z	V

TVKLV	Physical Education Course	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
BI-TS1	Theoretical Seminar I Tomáš Valla, Michal Opler, Dušan Knop, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Tomáš Valla, 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 Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Martin Pilný, Kate ina Kalášková Kate ina Kalášková Martin Pilný (Gar.)	KZ	4	3C	Z	V
FIT-TOP	Academic writing Petr Kroha, Tomáš Nová ek Tomáš Nová ek (Gar.)	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká, Petr Zemánek, Jan Ž árek Zden k Muziká Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tyrdik	Z,ZK	4	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	V
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán Petr Klán Petr Klán (Gar.)	KZ	3	1P+2C	L	V
BI-VAK.21	Selected Applications of Combinatorics Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ZS10	Bachelor internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
BI-ZS20	Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
BI-ZS30	Bachelor internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V.2021 Name=Purely Elective Courses of Bachelor Programme Informatics, version from 2021/22

TVK1	Physical Education	Z	1
TVV	Physical education	Z	0
TV1	Physical Education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKLV	Physical Education Course	Z	0

TVKZV	Physical Education Course	Z	0
BI-ADW.1		Z,ZK	4
	Windows Administration nted in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-ALO	Algebra and Logic	Z,ZK	4
-	and deepens the study of topics touched upon in the basic course in logic.	2,210	1 -
BI-AVI.21	Algorithms visually	Z.ZK	4
	ents other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute	1 '	ı end substantiall
knowledge presented	in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.o	rg <http: td="" www.al<=""><td>govision.org></td></http:>	govision.org>
that make understand	ding the principles of algorithms easy.		
BI-A2L	English language, preparation for the B2 level exam	Z	2
	ourse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievements		
	guage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
class of the term.	s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	rs during the firs
BI-APJ	Aplication Programming in Java	Z,ZK	4
-	nted in Czech. Advanced technologies in Java.	2,210	
NI-AFP	Applied Functional Programming	KZ	5
	nted in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function	1	anguages are or
the rise nowadays an	nd the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas	stering this paradic	gm becomes a
necessary competen	ce of a software engineer: the theory and especially the practice.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	ced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class		
space search, multi-a be presented as well	agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	thms and the neu	ral networks, wi
BI-BLE	Blender	Z,ZK	4
	Dierruer knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those		
	complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphi		
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is preser		_,	
BI-STO	Storage and Filesystems	Z,ZK	4
The student will learn	principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	archiving, as so as	storage scaling
load balancing and h	igh availability.		
BI-DAS	Data Structures	Z,ZK	5
	es more advanced data structures, including analysis of their complexity.		T
NI-PSD	Public Services Design	KZ	4
	duce students to specifics of UX, Service design and development for public sector. We will look into the design and development		
	designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati tudents-designers as well as clients.	on with client repr	resentatives.
BIE-DIF	Differential equations	Z,ZK	5
	a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essenti	1 '	_
	prems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered		
	followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicati		
partial differential equ	uations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD	Es and PDEs, inc	luding implicit
and explicit Euler me	thods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
NI-DZO	Digital Image Processing	Z,ZK	4
•	a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical	•	
-	an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that i		
	essing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF ostraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of	· · · · · · · · · · · · · · · · · · ·	_
	s-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a		
NI-DDM	Distributed Data Mining	KZ	4
= =	tate-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand	1	1
data processing fram	nework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation	ns and will be capa	able to propose
approaches to paralle	elize other algorithms. The course is prezented in czech language.		
BI-EP1.24	Effective programming 1	KZ	4
The course is taught			·
BI-EP2	Efficient Programming 2	KZ	4
	ent Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving ind	lividual problems	are discussed,
with the aim to choos	se the best one and avoid implementation errors.		
D: 411017	English language, contact preparation for the B2 level exam	Z	2
	ourse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievements		
	ulage instructionMeet the requirements for writing assignments - Summary Abstract. Argumentation PaperSucceed in both	, and middenin and	
The content of the coactive part in the lang	guage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	
The content of the coactive part in the lang	guage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	J
The content of the co active part in the lang tests with the succes class of the term.	s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	,	4
The content of the co active part in the lang tests with the succes class of the term. BI-EJA		Z,ZK	4
The content of the co active part in the lang tests with the succes class of the term. BI-EJA The course is on adv	s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by Enterprise Java	Z,ZK	4
The content of the co active part in the lang tests with the succes class of the term. BI-EJA The course is on adv	s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by Enterprise Java anced technologies in the Java programming language. The focus is on technologies for development of enterprise information	Z,ZK	4
The content of the co active part in the lang tests with the succes class of the term. BI-EJA The course is on adv a database and are a BI-EJK	s rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by Enterprise Java ranced technologies in the Java programming language. The focus is on technologies for development of enterprise information accessed through the web interface.	Z,ZK systems which ar	4 re connected to

BI-FMU	Financial and Management Accounting	Z,ZK	5
	s explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modific	-	
	based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manage	-	-
-	oduls in Business information systems.		
BI-HAM	HW accelerated network traffic monitoring	KZ	d analysis of
	students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. T Hatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as	_	=
	of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network t		
-	ir practical abilities in this field.		
BI-HMI This course is presented	History of Mathematics and Informatics d in Czech.	Z,ZK	3
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 appl		
· ·	eripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefor	-	
Software Engineering st		0 10 04114210 07011	
NI-IAM	Internet and Multimedia	Z,ZK	4
	cused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes a 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		
the quality and latency of	of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording		-
for audience.		7	0
BIE-CSI This is an introductory of	Introduction to Computer Science lass on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in othe	Z er fields but intere	2 sted in computer
-	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 progra		
	and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer		-
than expected, or even I	tions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are into less than before.	erestea in comput	er science more
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global e		•
	tory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econom		_
=	to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial inst economic history of particular European countries but rather the impact of trade and role of particular events, institutions an	-	
	a mixture of lecture and discussion.	a organizationo in	motory. Glass
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and ex examples.	tend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a	re able to apply th	nem in particular
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 Mic	rosoft platform. Th	ne students will
	d to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current te	-	
	and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQI 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	KZ	4
	oduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overvi Il learn to create WebAPI and to use it by client programs.	ew or the develop	nent possibilities
BI-SQL.1	Language SQL, advanced	KZ	4
	wledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. I	•	
	es, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the po clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan	=	
	res will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle	-	=
PostgreSQL.			
BI-QAP	Quantum algorithms and programming	KZ	5
	udents hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic	=	-
_	ns showing advantages and limitations of quantum computing. During tutorials students work in open-source software devel lowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VI	-	
	No previous knowledge of physics is assumed.	·	j
NI-LSM	Statistical Modelling Lab	KZ	5
-	on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is	-	
	d its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, is on the border of own research and may result in the topic of final work (diploma or bachelor thesis).	and analyses of t	nen properties.
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
	nts interested not only in technical scope of computer science, but also in making products usable - for users and for develop	ers. Students of t	his course can
	dge to design, plan and analyse their own projects in the context of human-centered security. Managerial Psychology	71/	2
NI-MPL NI-MSI	Managerial Psychology Mathematical Structures in Computer Science	ZK Z,ZK	<u>2</u> 4
	riviatriernatical Structures in Computer Science s of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Sco	· '	
Introduction to category			

BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
	on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Univ		
	and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of the peripheral devices and ARIs of salested devices.	JSB devices, Linu	ıx and Windows
	on development, and APIs of selected devices.	KZ	
BI-MIT	Mikrotik technologies the subject stands in the louter of the Router OS operating system and some network Mikrotik technologies which are a subject stands in the introduction of the Router OS operating system and some network Mikrotik technologies which are a		y the small and
	providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the		
	and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute	•	
and technologies of the	data-link, network and transport layer of the OSI model.		
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented progran	nming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, wh	ere its ability to na	atural abstraction
	modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the s	-	
, ,	dern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their developmen		
· -	bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo		· ·
	f semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involves the control of the contro		
BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5
_	is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment		
	tergr, SAGE and video mapping) and their applications in practice. Several rectures dear with the content creation for the ment ation, scientific data visualization, and 3D model scanning.	ioned technologie	s, namely fractal
BI-MMP	Multimedia team project	KZ	4
This course is presented	1	112	, -
BI-ORL	Operations Research and Linear Programming	KZ	5
	oduce students to the issues of operational research and primarily to the practical application of linear programming as a fun		_
•	rimarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as m	•	anon tooninguoi
NI-OLI	Linux Drivers	Z.ZK	4
_	stem is an important operating system for personal computer and also for embedded systems. Systems on chip and combining	,	sors and FPGAs
	of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development		
course provides knowle	dge of Linux operating system architecture, principles of development of various types drivers, including practical experience) .	
BI-ACM	Programming Practices 1	KZ	5
This is a selective cours	se for preparing talented student for representation in international programming contests.		<u> </u>
FIT-ACM1	Programming Practices 1	KZ	5
This is a selective cours	se for preparing talented student for representation in international programming contests.		<u> </u>
FIT-ACM2	Programming Practices 2	KZ	5
This is a selective cours	se for preparing talented student for representation in international programming contests.		
BI-ACM2	Programming Practices 2	KZ	5
This is a selective cours	se for preparing talented student for representation in international programming contests.		
FIT-ACM3	Programming Practices 3	KZ	5
	se for preparing talented student for representation in international programming contests.		7
BI-ACM3	Programming Practices 3	KZ	5
	se for preparing talented student for representation in international programming contests.		1
FIT-ACM4	Programming Practices 4	KZ	5
	se for preparing talented student for representation in international programming contests.		
BI-ACM4	Programming Practices 4	KZ	5
	se for preparing talented student for representation in international programming contests.		
FIT-ACM5	Programming Practices 5	KZ	5
	se for preparing talented student for representation in international programming contests.		
FIT-ACM6	Programming Practices 6	KZ	5
	se for preparing talented student for representation in international programming contests.	1/7	4
BI-AND.21	Programming for the Android Operating System	KZ	4
This course is presented		1/7	
BI-CS1	Programming in C# is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta	KZ	4
	is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta , definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de		
	properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugg		•
well as work with files a	• • • • • • • • • • • • • • • • • • • •	g	precedentig, and
BI-PJV	Programming in Java	Z,ZK	4
-	d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	_,	1
BI-PJS.1	JavaScript Programming	KZ	4
	is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases developmen	nt in Javascript. Th	ne course is
recommended for stude	ints of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register f	or this course in th	neir 4th semester
of study.			
BI-KOT	Programing in Kotlin	Z,ZK	4
	cally-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adv		
	iva compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of	a modern, object	-functional way
	plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
NI-PSL	Programming in Scala	Z,ZK	4
	rhe modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language fea y. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks		
Scalaz, etc.	y. Ocaia eriabies to use oi applications iurictional patterns e.g. n-List, ivioriaus, etc. Scala is used by many powerful frameworks	and iibranes e.g. l	iay, Cassanura,
BI-PMA	Programming in Mathematica	Z,ZK	4
	ן דוסקומוווווווון ווו אומנוופווומנוכמ g with modern technical and scientific software. Students will learn how to use different programming styles (functional progra	1	1 -
,	g with modern tearning and a continue continue of the proposing and propositations	3, 2400	,

BI-PHP.1	Programing in PHP	KZ	4
=	Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices		
•	ne course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register	for BIE-TWA.1. Th	ney should
	in their 3rd semester of study.	7 71/	4
BI-PS2	Programming in shell 2 I overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ad	Z,ZK	dooper insight
	er particular scripting languages and will get practical experience with shell script programming.	ultion, they gain a	deeper msignt
NI-PDD	Data Preprocessing	Z,ZK	5
	re raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da		-
	arn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characte		•
pages.		_	
BI-PKM	Introduction to mathematics	Z	4
This course is presente	id in Czech.	' '	
NI-REV	Reverse Engineering	Z,ZK	5
	inted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens		
	understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is de		
	C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be o	-	-
	ing work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compu minars, where students will solve practically oriented tasks from the real world.	ter maiware scene	. The locus of
BI-SCE1	Computer Engineering Seminar I	Z	4
	ter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance.		•
•	ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of		
	ssional 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 Compu	ter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance	ce to failures and a	ttacks. Students
are approached individe	ually 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 profe	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	chers. The topics a	are new for each
semester.			
BI-ST1	Network Technology 1	Z	3
=	to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredit	ed under the Cisco	o Netacad -
CCNA1 - R&S Intr			
BI-ST2	Network Technology 2	Z	3
This course is presente		Z	3
BI-ST3	Network Technology 3 harce the previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented duri		-
	the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pre	_	
simple topology, securit		aretability, exterior	5.1. 20y 5.1.u u
BI-ST4	Network Technology 4	Z	3
Students will further en	hance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switchi	ng presented durii	ng BI-ST1 and
BI-ST2 courses got furt	ther extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effects of the start fine-tune protocols.	ficiency, predictabi	lity, extension
beyond a simple topolo	gy, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete	ly other type of ne	twork (Non
	ess) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and swi		
	ency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitig	ation ways while n	naintaining the
network running.	Covinting Longue	7 71/	
BI-SKJ.21	Scripting Languages I overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ad	Z,ZK	4
	er particular scripting languages and will get practical experience with shell script programming.	ullon, they gain a	deeper msignt
BI-SOJ	Machine Oriented Languages	Z,ZK	4
	will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optima	1 1	
	n of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of vie	· ·	
This knowledge will be	used during reverse engineering, optimization, and evaluation of code security.	_	
FIT-SEP	World Economy and Business	Z,ZK	4
This course is presente	id in Czech. The course introduces students of technical university to the international business. It does that predominantly by	comparing individual	dual countries
	d economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as we		
•	ic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	of discussions base	ed on individual
	o take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SEP	World Economy and Business	Z,ZK	4
•	ed in Czech. The course introduces students of technical university to the international business. It does that predominantly by Id economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as we		
· -	ic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form		
•	o take bachelor level of this course BIE-SEP as a prerequisite.	J. 4.00400.0110 240	ou on mannada.
NI-SYP	Parsing and Compilers	Z,ZK	5
	the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge		-
of LR parsing and are in	ntroduced to special applications of parsers, such as incremental and parallel parsing.		
BI-GIT		1/7	2
	Version control system GIT	KZ	_
Students will be introdu	Version control system GIT ced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be then shown on DCVS.		
		ractically. In this pa	
even the implementatio	ced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve Systems Engineering	ractically. In this par r administrators.	rticular system
even the implementation BIE-SEG This is an introductory of	loced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve Systems Engineering class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	ractically. In this par r administrators. Z s of operating syste	O ems for students
even the implementation BIE-SEG This is an introductory of to understand processor	riced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve Systems Engineering class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After take	ractically. In this part administrators. Z s of operating systeting the class, students	0 ems for students ents are able to
even the implementation BIE-SEG This is an introductory of to understand processor understand the different	riced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve Systems Engineering class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After take the between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what contains the contai	ractically. In this part administrators. Z s of operating systeting the class, students	0 ems for students ents are able to
even the implementation BIE-SEG This is an introductory of to understand processor understand the different	riced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and principles will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve Systems Engineering class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After take	ractically. In this part administrators. Z s of operating systeting the class, stude	0 ems for students ents are able to

TV2K1	Physical Education 2	Z	1
BI-TS1	Theoretical Seminar I	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cla		•
-	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a. The capacity is limited by the the potentials of the teachers of the seminar.	s a work with scie	ntific papers and
BI-TS2	Theoretical Seminar II	Z	4
_	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cla		· ·
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		•
other scholarly literature	e. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS3	Theoretical Seminar III	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cla		•
	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 scie	ntific papers and
	e. The capacity is limited by the the potentials of the teachers of the seminar.	7	4
BI-TS4	Theoretical Seminar IV ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cla	Z ssical reading are	4
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		•
	e. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TDA	Test driven architecture	KZ	4
The course is focused of	on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that	are well known in	the DevOps
world. This course has a	a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur	in the semester pr	roject.
NI-TSP	Testing and Reliability	Z,ZK	5
_	ledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to		-
·	zation and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with analyze, and control the reliability and availability of the designed circuits.	n built-in-self-test e	equipment. They
BI-QUA	Quality Assurance	KZ	4
	students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the contex		•
	perience hands-on application testing using both manual and automated testing. At the end of the semester, the student sho		
· ·	f test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found		-
FIT-TOP	Academic writing	Z	2
Publishing is an importa	int and required part of research activity. It is not only about obtaining research results but also about applying them in the fo	rm of publication.	Writing scientific
publications can be use	ful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the	course, students v	vill learn how to
	what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting		•
	e will be taught in blocks, with theoretical part at the beginning of the semester and one practical at the end of the semester/be	eginning of the exa	am period. Dates
	d on the availability of enrolled students.	7.71/	
BI-CCN	Compiler Construction	Z,ZK	5
-	class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme		Students to
		e of the class.	
BI-TEX			4
BI-TEX This course is presented	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX).	Z,ZK	4 s on typographic
	TeX and Typography	Z,ZK	<u> </u>
This course is presented	TeX and Typography	Z,ZK	<u> </u>
This course is presented rules. BI-EHD	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX).	Z,ZK the course focuse:	s on typographic
This course is presented rules. BI-EHD This course is presented BI-KSA	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology	Z,ZK the course focuse: Z,ZK ZK	s on typographic 3
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester course	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the divergence.	Z,ZK the course focuse: Z,ZK ZK ersity of the world	s on typographic 3 2 - examples from
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester course anthropological research	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the divent from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	Z,ZK the course focuse: Z,ZK ZK ersity of the world	s on typographic 3 2 - examples from
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester cours anthropological researc shown. The course is presented to the presented by the presented shown.	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the divent from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he esented in Czech.	Z,ZK the course focuse: Z,ZK ZK arsity of the world ealth, history, deaf	3 2 - examples from th, etc) will be
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester cours anthropological researc shown. The course is presented by BI-ULI	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse in from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he essented in Czech. Introduction to Linux	Z,ZK the course focuse: Z,ZK ZK ersity of the world ealth, history, deat	3 2 - examples from th, etc) will be
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester cours anthropological researc shown. The course is presented by BI-ULI Students become familiary rules.	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse in Czech. Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become	Z,ZK the course focuse: Z,ZK ZK ersity of the world ealth, history, deat	3 2 - examples from th, etc) will be
This course is presented rules. BI-EHD This course is presented BI-KSA The one-semester cours anthropological researc shown. The course is presented by BI-ULI Students become familia and techniques of a United Students become familiary and techniques of a United Students because of a United Students becau	TeX and Typography d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to European Economic History d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Cultural and Social Anthropology se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse of the from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, material culture, language, he esented in Czech. Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).	Z,ZK the course focuse: Z,ZK ZK ersity of the world ealth, history, deat Z the familiar with base	3 2 - examples from th, etc) will be 2 sic commands
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BI-VAK.21 Selected Applications of Combinatorics	Z	3
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinator	rics. 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 an		,
with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (n	•	
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation	on algorithms, optimization and more	e. Students will
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		1 .
BI-VMM Selected Mathematical Methods	Z,ZK	4
The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgu	•	
properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (F the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with inter-	,	m. we examine
	Z.ZK	4
NI-VYC Computability Classical theory of recursive functions and effective computability.	Z,ZN	4
BI-ZS10 Bachelor internship abroad for 10 credits	Z	10
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign	<u> </u>	1
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evi	•	
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KO		
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This are	,	
exceeds the academic year's dead-line.		
BI-ZS20 Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other forei	ign scientific and/or research instituti	on. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evi	•	
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KO	•	
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This am	•	
exceeds the academic year's dead-line.	ŕ	·
BI-ZS30 Bachelor internship abroad for 30 credits	Z	30
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign	ign scientific and/or research instituti	on. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evi	idence of the professional content ar	nd 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 KO	S. 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 are	nount can be divided into two subjec	ts if the internship
exceeds the academic year's dead-line.		
BI-ZIVS Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial in	ntelligence. The aim of the course is	to teach students
modern humanoid robot control and development of applications in a graphical development environment. Lectures provide funda		0
interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and	d real hardware to get practical expe	rience with these
technologies.		1
BI-ZPI Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understandir	•	
learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation	• .	•
CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the o	overall context of information and bus	siness strategy of
an enterprise.		_
BI-ZNF PHP Framework Nette - basics	KZ	3
Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various lil	braries of this Czech popular framew	ork. The resulting
knowledge should serve for the efficient creation of a web backend in PHP language.	Τ	1
BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.		_
BI-ZWU Introduction to Web and User Interfaces	Z,ZK	4
This source is presented in Creek		

Code of the group: BI-PV-VO.21

Name of the group: Elective vocational Courses for a Bachelor Specialization BI-PV.21, version 2021

ΚZ

Requirement credits in the group:

Requirement courses in the group:

3D Printing

Credits in the group: 0

This course is presented in Czech.

BI-3DT.1

Note on the gro	oup:					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-AG2.21	Algorithms and Graphs 2 Tomáš Valla, Michal Opler, Dušan Knop, Ond ej Suchý, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	V
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Julia Plotnikova, Jakub Tetera, František Ková, Martin Šutovský, Martin Holec, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	V
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	V
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	V

BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-FBI.21	Financial Business Intelligence David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	Hardware Security Ji í Bu ek, Martin Šutovský, Ond ej Staní ek Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková T ísková Lenka Kosková T ísková (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B lohoubek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-LA2.21	Linear Algebra 2 Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	V
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MGA.21	Multimedia and Graphics Applications Ji í Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PGR.21	Computer graphics programming Petr Felkel, Jaroslav Sloup Jaroslav Sloup Petr Felkel (Gar.)	Z,ZK	5	2P+2C	L	V
BI-PRS.21	Practical Statistics Kamil Dedecius, Petr Novák Petr Novák Petr Novák (Gar.)	KZ	5	1P+2C	L	V
BI-PNO.21	Practical Digital Design Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	V
BI-PAI.21	Law and Informatics Zden k Ku era, Št pánka Havlíková, Dominik Vítek, Martin Samek, Ji í Maršál, Michal Mat jka Št pánka Havlíková Zden k Ku era (Gar.)	ZK	5	2P+2C	L	V
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek Tomáš Pecka (Gar.)	Z,ZK	5	2P+1C	L	V
BI-PPA.21	Programming Paradigms Jan Janoušek, Jan Liam Verter, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	V
BI-PGA.21	Programming of Graphic Applications Ji í Chludil, Radek Richtr Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	V
BI-PYT.21	Python Programming Martin Šlapák, Ond ej Bouchala, Mohamed Bettaz, Antonín Hruška, Yannick Daniel Gibson, Adam Skluzá ek Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	V
BI-PRR.21	Project management Tomáš Šubrt, Petra Pavlí ková, David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	V
BI-SWI.21	Software Engineering Ji í Mlejnek, Zden k Rybola Zden k Rybola Ji í Mlejnek (Gar.)	Z,ZK	5	2P+1C	L	V
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	V
BI-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Ji í Mlejnek Ji í Mlejnek (Gar.)	KZ	5	2C	Z	V
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	V
BI-SVZ.21	Machine vision and image processing Marcel Ji ina, Jakub Novák, David Kramný, Justýna Frommová Jakub Novák Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Jaroslav Borecký Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TAB.21	Applications of Security in Technology Ji í Dostál, Jan B Iohoubek, Martin Kolárik, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V

BI-TJV.21	Java Technology Stanislav Kuznetsov, Jan Blizni enko, Raian Samerkhanov Stanislav Kuznetsov Stanislav Kuznetsov (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	Z	V
BI-TIS.21	Information Systems Pavel Náplava, Jan Ko í Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	V
BI-TWA.21	Design of Web Applications Martin Urbanec, David Bernhauer, Otto Šleger David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-UKB.21	Introduction to Cybersecurity Jan B Iohoubek, David Pokorný, Ivana Trummová, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák David Pokorný Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	V
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
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	V
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-PV-VO.21 Name=Elective vocational Courses for a Bachelor Specialization BI-PV.21, version 2021

DB Technologies for Big Data ΚZ BI-BIG.21 5 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.

Applications of Security in Technology

The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.

Embedded Systems BI-VES.21

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-MPP.21 Methods of interfacing peripheral devices

Z,ZK

5

The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices.

BI-MVT 21 Modern Visualisation Technologies

Z,ZK

The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning.

BI-AG2.21 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-AG1.21. It further delives into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.21.

BI-ASB.21 Applied Network Security

Z,ZK

The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks.

BI-BEK.21 Secure Code

Z,ZK

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-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

The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation.

BI-FBI.21 Financial Business Intelligence The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-HWB.21 Hardware Security Z,ZK The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. BI-IOT.21 Internet of Things Z.ZK 5 The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS). BI-JPO.21 Computer Units Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KOM.21 Conceptual Modelling 7.7K 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 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. Mathematical Logic BI-LOG.21 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-MDF.21 Modern Data Formats 3 K7 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. Multimedia and Graphics Applications 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-OOP.21 **Object-Oriented Programming** 7.7K Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphasis is on practical techniques for developing software, which includes testing, error handing, refactoring, and application of design pattern. Computer graphics programming After attending this curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the scene, add textures imitating geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in computer graphics, such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing solid fundamentals for your professional development, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfaces, and scientific visualization. BI-PRS 21 K7 Practical Statistics 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-PNO.21 Practical Digital Design ΚZ 5 Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design tools. BI-PAI.21 7K 5 Law and Informatics The aim of the course 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 Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding contracts in real and 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 commercial license types and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection against their misuse. Students will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of real cases from practice.

	Programming Languages and Compilers	Z,ZK	5
	npiling methods of programming languages. They are introduced to intermediate representations used in current compilers C		
•	a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification uage but any text in a language generated by a given LL input grammar.	. The complier ca	n translate not
	Programming Paradigms	Z,ZK	5
	sic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of		ches. Functional
	and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming		
	on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main	stream programm	ing languages
such as C++ and Java. BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
	ne possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and th		-
· ·	natical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using		-
by implementation of plug			
	JavaScript Programming	KZ	5
	ction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code develor.		-
	Python Programming to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data	KZ Ita processing Th	5 e differences
	rogramming in Python and in other programming languages will be explained. Each topic is prepared for students in the form		
enables greater accent to	o individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semest	er work will be as	signed during
the semester.			
	Project management	Z,ZK	5
	to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, an argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk	-	-
	chedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for s		
	ge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in la		
	who will develop software or hardware in the form of team projects.		
	Network Programming	Z	5
	mental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level progro Designing communication protocols and their verification. The third part introduces the principles and applications of middle		
•	models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in co	_	
programming language e		,	,
BI-SWI.21	Software Engineering	Z,ZK	5
	with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They		
	e analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hance E UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design	=	
	pretical basis in the field of project management, estimation of costs of software projects, and methods of their development.	_	iii tile course,
BI-SP1.21	Team Software Project 1	KZ	5
Students gain hands-on	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	e BIE-SWI course	that runs
•	ches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project.		
and finished in the BIE-S	consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	artefact will be ful	tner developed
	Team Software Project 2	KZ	5
	experience with the iterative development process while working on a large-scale software project. The first iteration is the res	I	-
However, in this follow-up	o, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will wo	rk in teams of 4-6	people. The
	team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their so	1	_
	Machine Learning 1	Z,ZK	5
=	s to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working k he supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relations		
	undamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensic	•	
demonstrations, pandas	and scikit libraries in Python will be used.		
	Machine Learning 2	Z,ZK	5
-	s to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in proceedings and other dimensionality reduction methods.		
	he unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methecement learning and natural language processing.	ious. Moreover, st	udents get the
	Machine vision and image processing	Z,ZK	5
1	coming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate		
	ferent types of camera systems and a variety of methods for image and video processing. The course is focused on practical	use of camera sys	tems for solving
· · · · · · · · · · · · · · · · · · ·	the graduates may encounter.	7.71	
	Real-time systems c knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue	Z,ZK	5
	ntally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab		- 1
course.			
BI-TJV.21	Java Technology	Z,ZK	5
	owledge and skills for developing information systems and applications through concepts used in software development and	experience with lib	raries and tools
	system. At the course end, the students are able to develop software systems in Java platform.	7 71/	
· ·	Computer Networks Technologies udents with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physi	Z,ZK	5 overlap to the
	ovide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies	-	· ·
with the most important of	ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethe	•	
always with focus on high	n-speed networks.		

BI-TIS.21 Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-TUR.21 User Interface Design Z,ZK Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BI-TWA.21 Design of Web Applications The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React. BI-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. 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-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) BI-FEM.21 Fundamentals of Economics Z,ZK 5 The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. Basics of System Control 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-ZUM.21 Artificial Intelligence Fundamentals

Code

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

Completion Credits

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.

List of courses of this pass:

Name of the course

BI-3DT.1	3D Printing	KZ	4
BI-A2L	English language, preparation for the B2 level exam	Z	2
The content of the	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement	students are due	to: -Take an
active part in the	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the	e midterm and the	final term
tests with the succe	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi	vidual teachers du	ring the first
	class of the term.		
BI-AAG.21	Automata and Grammars	Z,ZK	5
Students are introd	uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	utomata, regular e	expressions,
and regular gramm	ars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the	hierarchy of forma	al languages
and the	ey understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity	classes P and NP.	
BI-ACM	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		,
BI-ACM2	Programming Practices 2	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		1
BI-ACM3	Programming Practices 3	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		ı
BI-ACM4	Programming Practices 4	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		1

BI-ADU.21	Unix Administration	Z,ZK	5
	the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They		
	administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,		-
processes, memo	ory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known or the control of	wledge from the le	ectures on
5 5	specific examples from practice.		
BI-ADW.1	Windows Administration This course is presented in Creek Hayayay there is an English variant in the pregram information (R4004 / 4753)	Z,ZK	4
DI AC4 04	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	7 71/	
BI-AG1.21	Algorithms and Graphs 1	Z,ZK	5
	rs the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cur vledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the		
· ·	orithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics, in particular, the asymptotic mathematics.	· · · · · · · · · · · · · · · · · · ·	inplexity of
BI-AG2.21	Algorithms and Graphs 2	Z,ZK	5
	ented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory	•	
· · · · · · · · · · · · · · · · · · ·	ces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Engl		
	BIE-AG2.21.		
BI-ALO	Algebra and Logic	Z,ZK	4
	The course extends and deepens the study of topics touched upon in the basic course in logic.	,	
BI-AND.21	Programming for the Android Operating System	KZ	4
	This course is presented in Czech.	'	
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-AN	G	
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement -	students are due	
	language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the		
tests with the succ	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi	vidual teachers du	ring the first
	class of the term.		
BI-APJ	Aplication Programming in Java	Z,ZK	4
	This course is presented in Czech. Advanced technologies in Java.		
BI-APS.21	Architectures of Computer Systems	Z,ZK	5
	rn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec	· · · · · · · ·	
	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the princ	•	
	r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of	•	
program. The cours	se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe	rence and consiste	ency in such
DI ADD	systems.	1/7	4
BI-ARD	Interactive applications on Arduino	KZ	4
	gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s		-
	ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	•	
not only on diopi	Software Engineering students.	io caltable even lei	Wob and
BI-ASB.21	Applied Network Security	Z,ZK	5
	urse 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.		_
BI-AVI.21	Algorithms visually	Z,ZK	4
The course comple	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so	ience that extend s	substantially
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	t;http://www.algovis	sion.org>)
	that make understanding the principles of algorithms easy.		
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 it is a configure, operate, test, and because it is a configure of the configuration of t		
	rice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam	ple of a web serve	
BI-BAP.21	Bachelor Thesis	Z	14
BI-BEK.21	Secure Code	Z,ZK	5
The students will le	earn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa	miliar with the thre	at modeling
-	s gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		
· ·	rileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing		-
	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the		
BI-BIG.21	DB Technologies for Big Data	KZ	5
	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	=	
concettori, transion	of individual technologies will be supplemented with specific examples from practice.	ar rouridation and p	resentation
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	-	-
BI-BPR.21	Bachelor project	Z	1
	g of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the		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		
The completed and	d signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the top	oic 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-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 of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class. 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 construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing, constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized. BI-CS2 C# language and data access ΚZ The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description). BI-CS3 Language C# - design of web applications ΚZ 4 The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on thisplatform. They will learn to create WebAPI and to use it by client programs. **BI-DAS Data Structures** Z.ZK 5 The course introduces more advanced data structures, including analysis of their complexity. BI-DBS.21 Z.ZK **Database Systems** 5 Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores. BI-DML.21 Discrete Mathematics and Logic Z.ZK Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics. BI-EHA.21 Ethical Hacking The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-EHD Introduction to European Economic History Z,ZK 3 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-EJA Enterprise Java Z.ZK 4 The course is on advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information systems which are connected to a database and are accessed through the web interface. BI-EJK Enterprise Java and Kotlin Z,ZK 4 The course is on advanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise information systems with microservice architecture, that can be deployed to the cloud. BI-EP1.24 Effective programming 1 ΚZ 4 The course is taught in Czech. BI-EP2 Efficient Programming 2 ΚZ 4 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors. BI-EPP.21 **Economic Business Processes** 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-FBI.21 Z.ZK Financial Business Intelligence The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-FEM.21 Z.ZK 5 Fundamentals of Economics The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. **BI-FMU** Financial and Management Accounting Z,ZK The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Inteligence moduls in Business information systems.

BI-GIT	Version control system GIT	KZ	2
Students will be in	troduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pract	cally. In this particu	ular system
even the i	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git :	server administrato	rs.
BI-GIT.21	SW Development Technologies	Z	3
	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to		-
This course is aim	from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use		on manager
DILLANA			
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. Th	_	- 1
network traffic are	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a s	ource of informatio	n and data
for analysis). The g	pals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traff	c on a hardware ar	nd software
	level and to develop their practical abilities in this field.		
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
This course is for	students interested not only in technical scope of computer science, but also in making products usable - for users and for developer	s. Students of this of	course can
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
DI-I IIVII	This course is presented in Czech.	2,21	5
DI LIMB 04	· · · · · · · · · · · · · · · · · · ·	7.71	
BI-HWB.21	Hardware Security	Z,ZK	5
	rith hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the opera		
modules, security for	eatures of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW res	ources, including s	ide-channel
attacks and tampe	ering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including a	pplications and rela	ated topics
	for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.		
BI-IDO.21	Introduction to DevOps	Z,ZK	5
The course deals v	vith the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of sys	ems and services.	The course
covers the tools to	support software development, testing and compilation. It also focuses on tools for automating infrastructure management and build	ing and deploying s	software to
the Cloud. It is an	introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquaint	ed with modern tec	chnologies
	used in practice.		· ·
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
200	This course is presented in Czech.		.
BI-IOT.21	Internet of Things	Z.ZK	5
	1	, ,	-
	s on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an over		
	ication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architer		
areas. within the	computer labs, students will gain practical experience with developing simple IoT systems using common development environments	(nardware - ARM,	ESP, STM;
	software - Arduino, Raspberry Pi OS).		
BI-JPO.21	Computer Units	Z,ZK	5
-	their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail v		
organization of cor	nputer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using approp	riate codes for impl	lementation
of multiplication. The	ne organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including	codes for error de	etection and
correction for paral	lel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of comm	unication of the pro	cessor with
the environment ar	nd the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micropro	grammed process	or simulator
	and programmable hardware design kits (FPGA).		
BI-KAB.21	Cryptography and Security	Z,ZK	5
	derstand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to		kevs and
	ems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in appl		
	actical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic proce		
BI-KOM.21	Conceptual Modelling	Z,ZK	5
	used on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key te		, ,
-	cify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological struc	-	
	v learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data represent		
	ns of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO r		MN notation
	Il be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up c		
BI-KOT	Programing in Kotlin	Z,ZK	4
	n, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advan		
The language is fu	ully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a		ctional way
	with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages)	<u> </u>	
BI-KSA	Cultural and Social Anthropology	ZK	2
	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversit	y of the world - exa	
anthropological res	search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, healt	ı, history, death, et	c) will be
	shown. The course is presented in Czech.		
BI-LA1.21	Linear Algebra 1	Z,ZK	5
We will introduce	students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	of real and comple	x 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	ation method (GEN	1) and show
the connection w	with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigen	alues and eigenve	ctors of a
	matrix. We will also demonstrate some applications of these concepts in computer science.		
BI-LA2.21	Linear Algebra 2	Z,ZK	5
	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 pros		
	ké s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou graf		
	eární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo áda	=	
	Ukážeme si také aplikace lineární algebry v r zných oborech.		,
BI-LOG.21			
	Mathematical Logic	7.7K	5
	Mathematical Logic s on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiabilit	Z,ZK	5 ce, and the
The course focuse	es on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability	y, logical equivalend	ce, and the
The course focuse		y, logical equivalend	ce, and the

approach	and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and a to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness the		/ntactic
BI-MA1.21	Mathematical Analysis 1	Z,ZK	5
We begin the cours	e 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 s	equences
	f a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions		
	ot-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and		
	ssue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical descriptions.		
BI-MA2.21	Mathematical Analysis 2	Z,ZK	6
-	tes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learr n method.The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to th		
	scribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, an	•	
•	we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and H	, ,	
	f localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integr		
BI-MDF.21	Modern Data Formats	KZ	3
The goal of the cou	rse 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 use	ed for that
data type	e along with tools available to work with such data. After finishing the course, the students should know how to work with common da	ta, e.g. on the Web.	
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
Students get acqu	uainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for world	king with images, vic	eos, 3D
	tion will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphics and the computer graphics in the computer graphic graphics in the computer graphic graphic graphic graphics in the computer graphic g	-	
	learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the processing transmission and representation systems, including real-time multimedia processing.	-	and use
	f graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating		
BI-MIT	Mikrotik technologies	KZ	3
	on of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are com		
	vice providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the me		
and now to administ	trate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer ne and technologies of the data-link, network and transport layer of the OSI model.	etworks concepts like	protocois
BI-ML1.21		Z.ZK	5
l l	Machine Learning 1 course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working kr	ı ' ı	-
=	dels in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationsh		
	the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional	•	
rananco, ana mion	demonstrations, pandas and scikit libraries in Python will be used.	data vioudiizationi n	. praotioai
BI-ML2.21	Machine Learning 2	Z,ZK	5
	urse is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in pai	· ' '	
and neural network	ss. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction method	ds. Moreover, studen	ts get the
	basic principles of reinforcement learning and natural language processing.		
BI-MMP	Multimedia team project	KZ	4
	This course is presented in Czech.	<u> </u>	
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
The course is focus	ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa		
		, ,	
includes both PC s	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE	, ,	
	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices.	3 devices, Linux and	Windows
BI-MVT.21	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies	3 devices, Linux and	Windows 5
BI-MVT.21 The goal of the cou	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augm	3 devices, Linux and Z,ZK nented reality, visuali	Windows 5 zation on
BI-MVT.21 The goal of the cou	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmalays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione	3 devices, Linux and Z,ZK nented reality, visuali	Windows 5 zation on
BI-MVT.21 The goal of the counting high resolution disp	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmalays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione and procedural visualization, scientific data visualization, and 3D model scanning.	Z,ZK nented reality, visualied technologies, name	Windows 5 zation on ely fractal
BI-MVT.21 The goal of the county high resolution disp	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmalays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione and procedural visualization, scientific data visualization, and 3D model scanning. Object-Oriented Programming	Z,ZK nented reality, visualied technologies, nam	5 zation on ely fractal
BI-MVT.21 The goal of the county high resolution disp BI-OOP.21 Object-oriented p	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmalays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione and procedural visualization, scientific data visualization, and 3D model scanning. Object-Oriented Programming rogramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	Z,ZK nented reality, visualied technologies, nam	5 zation on ely fractal 5 g. In this
BI-MVT.21 The goal of the county high resolution disp BI-OOP.21 Object-oriented p	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmalays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione and procedural visualization, scientific data visualization, and 3D model scanning. Object-Oriented Programming 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 emph	Z,ZK nented reality, visualied technologies, nam	5 zation on ely fractal 5 g. In this
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BI-PAI.21 Law and Informatics ZK 5 The aim of the course 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 Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding contracts in real and 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 commercial license types and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection against their misuse. Students will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of real cases from practice. Programming of Graphic Applications BI-PGA 21 Z,ZK The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their use for visualization of specific data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using built-in scripting languages and by implementation of plugins. BI-PGR.21 Computer graphics programming After attending this curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the scene, add textures imitating geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in computer graphics, such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing solid fundamentals for your professional development, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfaces, and scientific visualization. BI-PHP.1 Programing in PHP The course is taught in Czech.. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study. BI-PJP.21 **Programming Languages and Compilers** Z,ZK 5 Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers GNU and LLVM. They learn to create a specification 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 compiler can translate not only a programming language but any text in a language generated by a given LL input grammar. BI-PJS.1 ΚZ 4 JavaScript Programming Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Javascript. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 4th semester of study. BI-P.IS 21 JavaScript Programming K7 5 The course is an introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code development in Javascript easier BI-PJV Programming in Java Z,ZK 4 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753) **BI-PKM** Introduction to mathematics Z 4 This course is presented in Czech. **BI-PMA** Programming in Mathematica Z,ZK 4 Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional programming, rule-based programming etc.), how to create dynamic interactive applications and visualisations, data processing and presentations. BI-PNO.21 Practical Digital Design K7 5 Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design BI-PPA.21 **Programming Paradigms** Z,ZK 5 The course deals with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of particular approaches. Functional programming paradigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The principles are demonstrated on lambda calculus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstream programming languages such as C++ and Java. Project management BI-PRR.21 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 **Practical Statistics** K7 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 Z,ZK 4 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming. Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. BI-PST.21 Probability and Statistics Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical hypotheses and determining the statistical dependence of two or more random variables. BI-PYT.21 Python Programming The aim of the course is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data processing. The differences between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format of a Jupyter notebook, which enables greater accent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester work will be assigned during the semester.

BI-QAP	Quantum algorithms and programming	KZ	5
J	ng students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, o porithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developr		٠ ا
-	ge. 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-VMN		
	might be an advantage. No previous knowledge of physics is assumed.		
BI-QUA	Quality Assurance	KZ	4
	duces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should	= =	
•	n a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found		
BI-SAP.21	Computer Structure and Architecture	Z,ZK	5
•	acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arith	•	
memory, I/O comm	unication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proces in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.	ssor is practically imp	plemented
BI-SCE1	Computer Engineering Seminar I	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to		
are approached in	dividually 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 p	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are ne	w for each
BI-SCE2	semester.	Z	
	Computer Engineering Seminar II mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	_	4 s. Students
	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		
articles and other p	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are ne	w for each
D1 055	semester.	7.71	
BI-SEP	World Economy and Business sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by or	Z,ZK	4
	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as		
· -	nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of di		
	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SIP.21	Network Programming	Z	5
	fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level program of the designing communication protocols and their verification. The third part introduces the principles and applications of middleways.		
•	modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in col	ŭ	
	programming language environment.		
BI-SKJ.21	Scripting Languages	Z,ZK	4
Students gain a ge	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi	on, they gain a deep	er insight
DI CO I	into shell and some other particular scripting languages and will get practical experience with shell script programming.	7 71/	
BI-SOJ Students of the cou	Machine Oriented Languages	Z,ZK	4
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Students of the cou	Machine Oriented Languages Irse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view ling This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	e of microprocessor nked to higher level la	's features
Students of the cou and efficient cooper BI-SP1.21	Machine Oriented Languages Irse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view lir. This knowledge will be used during reverse engineering, optimization, and evaluation of code security. Team Software Project 1	e of microprocessor nked to higher level la	's features anguages.
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BI-ST4 Network Technology 4 3 Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running. **BI-STO** Storage and Filesystems The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling, load balancing and high availability. BI-SVZ.21 Machine vision and image processing Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate image information. The course introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use of camera systems for solving problems of practice that the graduates may encounter. BI-SWI.21 Software Engineering Z,ZK Students get acquainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They consolidate and practically verify their knowledge during the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-on experience with CASE tools using the visual language UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design and testing. Within the course, students also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their development. Applications of Security in Technology BI-TAB.21 Z,ZK 5 The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security Test driven architecture The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are well known in the DevOps world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in the semester project BI-TDP21 **Documentation and Presentation** 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. **BI-TEX** TeX and Typography Z,ZK This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course focuses on typographic rules. Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. Java Technology BI-TJV.21 Z,ZK 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z,ZK The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TS1 Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar III BI-TS3 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. Theoretical Seminar IV BI-TS4 7 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TUR.21 Z,ZK 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. BI-TWA.21 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 fa	icilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfon on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework Reac		elopments/
BI-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	inted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer s		
•	oduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, why cooling is necessary, and how to reduce the processors generate heat, which is not the processor of	•	
limits to the maxim	um operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a cor (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.	nputer power supp	y looks like
BI-UKB.21	Introduction to Cybersecurity	Z,ZK	5
	urse is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic over		-
-	and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace re	gulations.	
BI-ULI	Introduction to Linux	Z	2
Students become	familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become		commands
511100 51	and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (te		_
BI-UOS.21	Unix-like Operating Systems	KZ	5
	i systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative fu uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic proper		1
	eads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level		•
only able	to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting in	terface, called she	l.
BI-VAK.21	Selected Applications of Combinatorics	Z	3
	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the based on the computer science and combinatorics are contrast to the based on the contrast to the contrast t		
	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic		
•	icipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info In so be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimiz		
will select problem	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.	ation and more. St	dents wiii
BI-VDC.21	Virtualization and Data Centers	Z,ZK	5
	rse is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and	1 '	_
infrastructure, suc	h as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data ce	nter technologies fr	om private
· · · · · · · · · · · · · · · · · · ·	rid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications.		
	ation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, o	_	
BI-VES.21	Embedded Systems esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedden	Z,ZK	5 ir integrated
Students learn to de	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.	ieu processors, me	ii iiilegialeu
BI-VHS	Virtual game worlds	ZK	4
	tudents to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students	1	
complemented by	the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world.	he course can be f	ollowed by
	the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devi		
BI-VIZ.21	Data Visualization	KZ	5
	in overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understandi as such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preproces	0 ,	
	at a such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of	٠,	٠ ا
	examples in the Python programming language.		
BI-VMM	Selected Mathematical Methods	Z,ZK	4
-	s with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then ac		
	r, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the w		e examine
BI-VPS.21	ne linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting Selected Topics in Computer Networking	Z,ZK	5
	pon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technology	,	
	al area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practica		
dev	vices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance	e, and security.	
BI-VR1	Virtual reality I	KZ	4
	all Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements o		
The course focuse	es on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves con	nputational thinking	, empathy
DL V/DO	and shared social activities.	V7	
BI-VR2 Continuation of the	Virtual reality II course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The obje	KZ	3 applications
Continuation of the	for computer science and gamification in various social metaverse and desktop engines.	otive is to develop	applications
BI-VWM.21	Searching the Web and Multimedia Databases	Z,ZK	5
Students get basi	c overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage		
	nformation about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from		
	rity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web se data types (documents).	_	
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
•	ed system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion cont		
	ivigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get l	_	
,	technologies.	, , , , , , , , , , , , , , , , , , , ,	
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain th	ne basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech po	pular framework. T	he resulting
D: 75:	knowledge should serve for the efficient creation of a web backend in PHP language.	177	
BI-ZPI	Process engineering fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process.	KZ	4 and they will
	used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of bus	_	
	, , , , , , , , , , , , , , , , , , ,	,	

CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. BI-ZRS.21 Basics of System Control Z.ZK 5 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 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 7 20 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS30 Bachelor internship abroad for 30 credits 30 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZSB.21 Basics of System Security The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis. Artificial Intelligence Fundamentals Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course. BI-ZWU Introduction to Web and User Interfaces This course is presented in Czech. **BIE-CSI** Introduction to Computer Science Ζ 2 This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fields but interested in computer science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The goal of the class is to introduce and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level programming languages and tools are done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science 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 interested in computer science more than expected, or even less than before. **BIF-DIF** Differential equations This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential solution methods like separation of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with methods like characteristic polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications. Finally, an introduction to partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. BIF-FFC English language external certificate 7 4 The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding the B2 level of the Common European Framework of Reference for Languages. BIE-IMA2 Introduction to Mathematics 2 2 Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Systems Engineering **BIE-SEG** Ζ 0 This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of operating systems for students to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the class, students are able to understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concurrency is, as opposed to parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. Artificial Intelligence Fundamentals Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well. FIT-ACM1 Programming Practices 1 K7 5 This is a selective course for preparing talented student for representation in international programming contests FIT-ACM2 Programming Practices 2 K7 5 This is a selective course for preparing talented student for representation in international programming contests. FIT-ACM3 **Programming Practices 3** ΚZ 5 This is a selective course for preparing talented student for representation in international programming contests.

FIT-ACM4	Programming Practices 4	KZ	5
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FIT-ACM5	Programming Practices 5 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
FIT-ACM6	Programming Practices 6 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
FIT-ITI	Modern IT infrastructure	Z,ZK	5
	and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A mo		1
s understood he	re as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies.	The proposed sol	ution shou
	thus be capable of continuous and economically optimal operation.		
FIT-SEP	World Economy and Business	Z,ZK	4
•	esented in Czech. The course introduces students of technical university to the international business. It does that predominantly by c		
, ,	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as onomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of d		
orruption and co	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	13043310113 124304	on marvia
FIT-TOP	Academic writing	Z	2
_	nportant and required part of research activity. It is not only about obtaining research results but also about applying them in the form	of publication. Wri	
oublications can b	be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the cou	rse, students will	learn how
	rticle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an		-
lse's article. The	course will be taught in blocks, with theoretical part at the beginning of the semester and one practical at the end of the semester/begin	ning of the exam p	period. Da
EITE EUD	will be determined based on the availability of enrolled students.	7.71	
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	duces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global ecc s in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	, ,	•
	npire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions.	-	
	etailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	-	
	meetings will consist of a mixture of lecture and discussion.		-
NI-AFP	Applied Functional Programming	KZ	5
his course is pre	sented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional p	rogramming lang	uages are
the rise nowaday	s and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master	ring this paradigm	becomes
	necessary competence of a software engineer: the theory and especially the practice.		
NI-DDM	Distributed Data Mining	KZ	4
	n state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands or state-of-the-art approaches for distributed DM / ML algorithms. They will learn principles of their parallel implementations of		_
data processing in	ramework 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.	and will be capabi	e to propo
NI-DSP	Database Systems in Practes	Z,ZK	4
INI-DOI	This course is presented in Czech.	2,213	4
NI-DZO	Digital Image Processing		
	Digital illiage Flocessing	Z.ZK	4
This course pres	ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg	Z,ZK gorithms that are b	
•		orithms that are b	ooth easy
mplement and have of digital image	ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algore 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	gorithms that are b so valuable outsid compression, de-	ooth easy tooth easy tooth le the domi
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NI-PSD	Public Services Design	KZ	4
The course will int	roduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p	rocess from the pe	rspective o
suppliers (devs	and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboratio	n 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	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featur	es - e.g.pattern ma	tching 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 Scalaz, etc.	d libraries e.g. Play,	Cassandra
NI-REV	Reverse Engineering	Z,ZK	5
Students will get a	cquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens bef	ore and after the m	ain functio
is called. Student	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 o
applications wr	itten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be d	edicated to debug	gers: how
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	application
	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 with	the help o
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	iilt-in-self-test equi _l	pment. The
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will ga	in knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	organizations. The	ey will get
acquainted with v	irtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	ently operate and o	ptimize the
performance pa	arameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology tod	ay for the
management of co	omplex 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 integratio
	and development tools (Continuous integration and development).		
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.		'
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVK1	Physical Education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
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Physical education

Physical education

For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2025-11-14, time 09:12.

TVV

TVV0