Study plan

Name of study plan: Bachelor Specialization Computer Systems and Virtualization, in Czech, 2024

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 2024/2025 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	· O · y	Jul 0.4 0	1	To Grady.	
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 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BI-BPR.21	Bachelor project Zden k Muziká Zden k Muziká (Gar.)	Z	1	0P+0C	Z,L	PP
BI-DBS.21	Database Systems Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, Pavel K íž, Št pán Pechman, Dominik Roudný, Jan Bittner, Ji í Hunka Michal Valenta (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Ji ina Scholtzová, Daniel Dombek, Jan Sp vák Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Ivana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BI-LA1.21	Linear Algebra 1 Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

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

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

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

BI-AAG.21 Automata and Grammars

Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions, and regular grammars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

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

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

BI-DBS.21 Database Systems Z,ZK 5

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

BI-DML.21 Discrete Mathematics and Logic Z,ZK

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

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

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

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

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

BI-MA1.21 Mathematical Analysis 1 We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms. BI-MA2.21 Mathematical Analysis 2 The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learn how to integrate by parts and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the computation of elementary functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and its analysis using the Master theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and Hessian matrix, we study the analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of multivariate functions. BI-OSY.21 Operating Systems In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread implementations, race conditions, critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitoring. They are able to design and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows. BI-PSI.21 Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. Probability and Statistics Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical hypotheses and determining the statistical dependence of two or more random variables. Programming and Algorithmics 1 Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching, sorting, and manipulating with linked lists and trees BI-PA2.21 Programming and Algorithmics 2 Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, list, set, table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e.g., template programming, copying/moving of objects, operator overloading, inheritance, polymorphism). Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithmetic-logic unit, controllers, memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple processor is practically implemented in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. Technological Fundamentals of Computers Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-GIT.21 **SW Development Technologies** 3 This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to Git, the information manager from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use. BI-TDP.21 **Documentation and Presentation** ΚZ 3 The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically final university theses. Students learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present it in front of classmates and the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed. Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating

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

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 , Petr Zemánek, Miroslav Prágl 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 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

BI-ADU.21 Unix Administration 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

Z,ZK

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-7SB 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	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

Z,ZK Modern IT infrastructure 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.

of individual technologies will be supplemented with specific examples from practice.

Z.ZK

BI-TAB.21 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.

BI-VES.21 Embedded Systems Z,\overline{ZK}

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.24

Name of the group: Physical Education, version 2024

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
TV1	Physical Education	Z	0	0+2	Z	PT
TVV	Physical education	Z	0	0+2	Z,L	PT
TVK1	Physical Education Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,Z	PT
TVV0	Physical education	Z	0	0+2	Z,L	PT
TV2	Physical Education	Z	0	0+2	L	PT
TVKZV	Physical Education Course	Z	0	7dní	Z	PT
TVKLV	Physical Education Course	Z	0	7dní	L	PT

Characteristics of the courses of this group of Study Plan: Code=BI-PT.24 Name=Physical Education, version 2024

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

Name of the block: 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 till

2024/25

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 Kate ina Valentová (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V

BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V
BI-BLE	Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes Tomáš Vichta Tomáš Vichta (Gar.)	Z,ZK	4	2P+1C	L	V
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
NI-PSD	Public Services Design David Pešek, Ond ej Brém David Pešek Ond ej Brém (Gar.)	KZ	4	1P+2C		V
BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	V
BI-ANGK	English language, contact preparation for the B2 level exam Kate ina Valentová (Gar.)	Z	2	2C	Z,L	V
BI-EJA	Enterprise Java Ji i Dan ek	Z,ZK	4	2P+2C	L	V
BI-EJK	Enterprise Java and Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-FMU	Financial and Management Accounting David Buchtela	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring	KZ	4	2P+1C	L	V
BI-HMI	Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.) History of Mathematics and Informatics	Z,ZK	3	2P+1C	L	V
BI-ARD	Alena Šolcová Alena Šolcová (Gar.) Interactive applications on Arduino Jan ezní ek, Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	V
NI-IAM	Internet and Multimedia Ji (Melnikov	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science	Z	2	2C	Z	V
FITE-EHD	Christoph Kirsch Christoph Kirsch (Gar.) Introduction to European Economic History	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Tomáš Evan 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	L	V
BI-HAS	Kamil Dedecius Kamil Dedecius Kamil Dedecius (Gar.) Human Aspects in Cryptography and Security	Z,ZK	5	2P+1C	Z	V
NI-MPL	Ivana Trummová Ivana Trummová Ivana Trummová (Gar.) Managerial Psychology		2	2P	Z,L	V
NI-MSI	Jan Fiala Jan Fiala (Gar.) Mathematical Structures in Computer Science	Z,ZK	4	2P+1C	L	V
BI-MPP.21	Jan Starý Methods of interfacing peripheral devices	Z,ZK	5	2P+2C	Z	V
BI-MIT	Miroslav Skrbek Miroslav Škrbek Miroslav Skrbek (Gar.) Mikrotik technologies	KZ	3	1P+2C	 	V
NI-MOP	Jan Fesl Jan Fesl Jan Fesl (Gar.) Modern Object-Oriented Programming in Pharo	KZ	4	3C	Z	
	Jan Blizni enko Robert Pergl Robert Pergl (Gar.) Modern Visualisation Technologies					V
BI-MVT.21	Ji í Chludil, Petr Pauš Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Operations Research and Linear Programming Dušan Knop Dušan Knop Dušan Knop (Gar.)	KZ	5	1P+2C	L	V
NI-OLI	Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ACM	Programming Practices 1 Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
FIT-ACM1	Programming Practices 1 Tomás Valla	KZ	5	4C	L	V

FIT-ACM2	Programming Practices 2	KZ	5	4C	Z	V
	Ond ej Suchý Programming Practices 2					
BI-ACM2	Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	Z	V
FIT-ACM3	Programming Practices 3 Ond ej Suchý	KZ	5	4C	L	V
ВІ-АСМЗ	Programming Practices 3 Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
FIT-ACM4	Programming Practices 4 Ond ej Suchý	KZ	5	4C	Z	V
BI-ACM4	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
FIT-ACM5	Programming Practices 5	KZ	5	4C	L	V
FIT-ACM6	Ond ej Suchý Programming Practices 6	KZ	5	4C	L	V
BI-AND.21	Ond ej Suchý Programming for the Android Operating System	KZ	4	3C	L	V
DI-AIVD.21	Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C#	1\2		30	_	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 Ji Dan ek Ji Dan ek Ji Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala	Z,ZK	4	2P+1C	Z	V
BI-PMA	Jií Dan ek Ji i Dan ek Jií Dan ek (Gar.) Programming in Mathematica	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Zden k Buk Zden k Buk Zden k Buk (Gar.) Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2	Z,ZK	4	2P+2C	L	V
NI-PDD	Lukáš Ba inka Data Preprocessing	Z,ZK	5	2P+1C	Z	V
BI-PKM	Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.) Introduction to mathematics		4		Z	V
NI-REV	Tomáš Kalvoda Tomáš Kalvoda (Gar.) Reverse Engineering		5	1P+2C	Z	
	Josef Kokeš Josef Kokeš Josef Kokeš (Gar.) Computer Engineering Seminar I	Z,ZK				V
BI-SCE1	Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Network Technology 4 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	L	V
BI-SKJ.21	Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2+2	L	V
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
FIT-SEP	World Economy and Business Tomáš Evan	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 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	Z	1		L,Z	V
TVV	Luboš Neuman Ji í Drnek (Gar.) 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 Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture Marek Hakala	KZ	4	2P+1C	Z,L	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	KZ	4	3C	Z	٧
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká, Petr Zemánek, Jan Ž árek Zden k Muziká Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tyrdík	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 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	٧
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 till 2024/25

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

TVKLV BI-ADW.1	Discription Course	7	
DI-ADVV. I	Physical Education Course	Z,ZK	0 4
This course is presen	Windows Administration ed in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-ALO	Algebra and Logic	Z,ZK	4
	nd deepens the study of topics touched upon in the basic course in logic.	_,,	•
BI-AVI.21	Algorithms visually	Z,ZK	4
•	nts other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute		
	n BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.or	rg <http: td="" www.alg<=""><td>ovision.org></td></http:>	ovision.org>
	ng the principles of algorithms easy. English language, preparation for the B2 level exam	Z	2
BI-A2L The content of the con	English language, preparation for the B2 level exam irse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme	l .	
	uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
tests with the success	rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teachers	during the firs
class of the term.			
BI-APJ	Aplication Programming in Java	Z,ZK	4
	ed in Czech. Advanced technologies in Java.	1/7	
NI-AFP	Applied Functional Programming ed in Czech. Functional programming paradigms. Traditional and novel function	KZ	5
•	I the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas		
	e of a software engineer: the theory and especially the practice.	0 , 0	
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduc	ed to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class	ssical tasks from th	e areas of state
•	pent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	thms and the neur	al networks, wi
be presented as well.	Diameter	7 71/	4
BI-BLE	Blender Blender Blender from Bl-MGA (Multimedia and Graphics Applications) course. It is intended for those	Z,ZK	4
	omplete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphic		
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is presen		_,,	•
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	rchiving, as so as	storage scaling
load balancing and hi			
NI-PSD	Public Services Design	KZ	4
	ice students to specifics of UX, Service design and development for public sector. We will look into the design and development	-	-
	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati Idents-designers as well as clients.	on with client repre	esentatives.
BIE-DIF	Differential equations	Z,ZK	5
	foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essenti-		_
•	ems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered		-
polynomial analysis, f	ollowed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicati	ons. Finally, an intr	oduction to
	ations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODI	Es and PDEs, inclu	uding implicit
•	nods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
NI-DZO	Digital Image Processing		
-	s according a promise of madern matheda for interactive adition of digital images and vides. It mainly deals with practical .	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 it	algorithms that are	both easy to
•	a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical a n interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is ssing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF	algorithms that are s also valuable out	both easy to side the domain
of digital image proce	n interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is	algorithms that are s also valuable out: R compression, de-	both easy to side the domair blurring in
of digital image proce frequency domain, ab	n interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that issing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF	algorithms that are salso valuable out: R compression, deconversion, context	both easy to side the domain blurring in enhancement
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray oppossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, an Distributed Data Mining	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha	both easy to side the domain blurring in enhancement matting.
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, at Distributed Data Mining te-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ	both easy to side the domain blurring in enhancement matting. 4 vith large scale
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta data processing frame	n interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, and Distributed Data Mining te-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handwork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation.	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ	both easy to side the domain blurring in enhancement matting. 4 vith large scale
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta data processing frame approaches to paralle	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, at Distributed Data Mining tete-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handwork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation ize other algorithms. The course is prezented in czech language.	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ ds on experience was and will be capa	both easy to side the domain blurring in enhancement matting. 4 with large scale ble to propose
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta data processing frame approaches to paralle BI-EP1.24	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, and Distributed Data Mining ter-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand work Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation ize other algorithms. The course is prezented in czech language. Effective programming 1	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ	both easy to side the domain blurring in enhancement matting. 4 vith large scale
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta data processing frame approaches to paralle BI-EP1.24 The course is taught i	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, as Distributed Data Mining stee-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand work Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation ize other algorithms. The course is prezented in czech language. Effective programming 1 Czech.	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ ds on experience was and will be capa	both easy to side the domain blurring in enhancement matting. 4 with large scale ble to propose
of digital image proce frequency domain, ab interactive as-rigid-as NI-DDM Course focuses on sta data processing frame approaches to paralle BI-EP1.24 The course is taught i BI-EP2	in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, and Distributed Data Mining ter-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand work Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation ize other algorithms. The course is prezented in czech language. Effective programming 1	algorithms that are s also valuable out: R compression, deconversion, context dding depth, alpha KZ ds on experience was and will be capa KZ	both easy to side the domain blurring in enhancement matting. 4 with large scale ble to propose
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BI-HAM	HW accelerated network traffic monitoring	KZ	d analysis of
	es students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. andatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as		=
	als of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network		
evel and to develop	their practical abilities in this field.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is preser		1/7	4
BI-ARD	Interactive applications on Arduino ed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple app	KZ	4
-	d peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedde		
	f a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefo	•	
Software Engineering	g students.		
VI-IAM	Internet and Multimedia	Z,ZK	4
	s focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes a	= '	
	gnals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practi sions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the		
	by of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recordin		•
or audience.	,	3	
BIE-CSI	Introduction to Computer Science	Z	2
his is an introductor	y class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in oth	er fields but intere	sted in compute
	students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	•	
•	ciples of computer science for students to understand, early on, what computer science is, why things such as high-level progra e, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer		
	estions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are int	•	•
han expected, or ev		,	
FITE-EHD	Introduction to European Economic History	Z,ZK	3
he course introduce	es a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global	economy through	the description
	history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econor	•	ū
•	re to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial ins	•	
	ed economic history of particular European countries but rather the impact of trade and role of particular events, institutions an of a mixture of lecture and discussion.	id organizations in	nistory. Class
BIE-IMA2		Z	2
	Introduction to Mathematics /		
	Introduction to Mathematics 2 extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they	_	nem in particula
Students refresh and		_	nem in particula
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BI-MIT Mikrotik technologies	KZ	3
The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are designed in the subject stands in the subject sta	commonly used by	y the small and
middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the	, ·	
and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute	er networks conce	pts like protocols
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 programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who	-	
is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the s	skills of design and	l implementation
of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development		
addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo		=
technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involves	ement in the Pha	ro Consortium.
BI-MVT.21 Modern Visualisation Technologies	Z,ZK	5
The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	igmented reality, v	risualization on
high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment	ioned technologie	s, namely fractal
and procedural visualization, scientific data visualization, and 3D model scanning.		
BI-MMP Multimedia team project	KZ	4
This course is presented in Czech.		
BI-ORL Operations Research and Linear Programming	KZ	5
The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fun	damental optimiz	ation technique.
Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as m	anagement).	
NI-OLI Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining	, , , , , , , , , , , , , , , , , , ,	sors and FPGAs
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development		
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience		
BI-ACM Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	I\Z	9
	KZ	5
	NZ.	3
This is a selective course for preparing talented student for representation in international programming contests.	147	
FIT-ACM2 Programming Practices 2	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.		
FIT-ACM3 Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM3 Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM4 Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		Ū
BI-ACM4 Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	IVE	3
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FIT-ACM5 Programming Practices 5	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM6 Programming Practices 6	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-AND.21 Programming for the Android Operating System	KZ	4
This course is presented in Czech.		
BI-CS1 Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta	l construction, typ	es of variables,
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de	finition and class	instancing,
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggi	ing and exception	processing, as
well as work with files are emphasized.		
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-PJS.1 JavaScript Programming	KZ	4
Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases developmen		•
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	· · · · · · · · · · · · · · · · · · ·	
of study.	or and dodred in a	ion in comocion
BI-KOT Programing in Kotlin	Z,ZK	4
Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adv		•
The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of		
with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).	a modern, object	-idilollal way
	7 71/	4
NI-PSL Programming in Scala	Z,ZK	•
The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feat		-
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 incraries e.g. l	-ıay, ∪assandra,
Scalaz, etc.	7 714	4
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 styles)	amming, rule-base	ed programming,
etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.		
BI-PHP.1 Programing in PHP	KZ	4
The course is taught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices		
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. TI	ney should
register for this course in their 3rd semester of study.		

Students gain a general serview of available scripting suppages, and sell get an granted an explained scripting suppages and sell get a mortal designation was the all scripting suppages and sell get a mortal designation with earlier processing of subserts fairn to pregione are disable for time processing and analysis. They learn what algorithms can be used to extract information from vortious class sources, such as irrupes, tooks, time series, etc., and team the skills to apply these fleveristical concepts to solve specific problems in individual projects - e.g., extraction of characteristics from images for from web topics. BEPKIM Introduction to mathematics Z. X 5 Introduction to mathematics Reversible of Cach. NEEVI Reversible of Cach. Introduction to mathematics S. Reversible of Cach. Introduction to mathematics Introduction to ma	BI-PS2			
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SNEPDID DISTALE PROPROCESSING Souther later no perspect are case for the train processing and analysis. They learn what algorithms can be used to establish information from various data sources, such as images, texts, time series, etc., and learn the salls to apply these theoretical concepts to solve specific processing and the salls to apply these theoretical concepts to solve specific processing in individual property. BIFFKM Introduction to mathematics Z			ldition, they gain a	deeper insight
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for computer science and gamification in various social metaverse and desktop engines.	understand the design and impleme BI-TEX TeX and This course is presented in Czech. Trules. BI-EHD Introduct This course is presented in Czech. The course is presented in Czech. The one-semester course aims to anthropological research from our thown. The course is presented in Country that the beand techniques of a Unix-like system BI-ULI Introduct Students become familiar with the beand techniques of a Unix-like system BI-OPT Introduct Students get basic overview of optic of optical network technology and odispersion compensators, and other the most up-to-date topics presente ultrastable frequency transfer, or sefrom practice. NI-VCC Virtualization principular performance parameters of modern management of complex computers and development tools (Continuous BI-VHS Virtual gone The course leads students to create complemented by the theory of game the course MI-PVR with the task of BI-VR1 Virtual Reality (VR), The course focuses on the ways of and shared social activities.	Interest of programming languages. Seeing and actually understanding self-compilation is the overarching theme Typography This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the tion to European Economic History However, there is an English variant in the program Informatics (B1801 / 4753). and Social Anthropology (equaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diveractic cultures (topics: kinship, religion, social exclusion, migration, globalization, material culture, language, he Czech. tion to Linux basics of the Linux operating system using e-learning form. They learn to work with the command line and become m. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). tion to Optical Networks can networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on pure in their solutions. The course will include the history of optical communications, an overview of passive components), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systed at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such anson networks. The labs will focus on real work with optical components and on measurement of their parameters ation and Cloud Computing hitectures of large computer systems that are used in data centers and computer infrastructure of companies and ples, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficit computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skil integration and development). arm worlds a complex virtual world. The course is a continuation o	z,ZK he course focuses Z,ZK he course focuses Z,ZK zk rsity of the world calth, history, deat alth, history, deat z e familiar with bas z,ZK ossible problems hts (optical fibres, stems). The cours as the accurate to securate	4 s on typographic 3 2 examples from h, etc) will be 2 sic commands 4 with deployment multiplexors, e will also cover ime on Internet, live real tasks 5 they will get and optimize the day for the odern integration 4 the is furthermore be followed by 4 communication. sing, empathy
	understand the design and impleme BI-TEX TeX and This course is presented in Czech. Trules. BI-EHD Introduct This course is presented in Czech. The course is presented in Czech. The one-semester course aims to anthropological research from our shown. The course is presented in County to an techniques of a Unix-like system BI-ULI Introduct Students become familiar with the band techniques of a Unix-like system BI-OPT Introduct Students get basic overview of optic of optical network technology and of dispersion compensators, and other the most up-to-date topics presente ultrastable frequency transfer, or se from practice. NI-VCC Virtualization principular performance parameters of modern management of complex computers and development tools (Continuous BI-VHS Virtual grand the course leads students to create complemented by the theory of game the course leads students to create complemented by the theory of game the course focuses on the ways of and shared social activities. BI-VR2 Virtual Reality (VR), The course focuses on the ways of and shared social activities. BI-VR2 Virtual Reality (VIII) Reality (VIII) Reality (VIII) Reality (VIII) Reality (VIIII) Reality (VIIII) Reality (VIIII) Reality (VIIII) Reality (VIIIII) Reality (VIIIII) Reality (VIIIIIII) Reality (VIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	entation of programming languages. Seeing and actually understanding self-compilation is the overarching theme Typography 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). Te second part of the 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). Te second part of the course gives basics of the Linux operating system using e-learning form. They learn to work with the command line and become medical to Linux operating system using e-learning form. They learn to work with the command line and become medical to Linux operating system using e-learning form. They learn to work with the command line and become medical to Linux operating system using e-learning form. They learn to work with the command line and become medical to Linux operating system using e-learning form. They learn to work with the command line and become medical to the Linux operating system using e-learning form. They learn to work with the command line and become medical to the Linux operating system set using the process of the Linux operating system will include the history of optical communications, an overview of passive components, and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system or networks. The labs will focus on real work with optical components and on measurement of their parameters attended to have a papilications, such as a complex virtual word. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current is ne design, pr	z,ZK he course focuses Z,ZK the course focuses Z,ZK zK rsity of the world calth, history, deat z e familiar with base Z,ZK ossible problems his (optical fibres, stems). The cours as the accurate to s. Students will so Z,ZK d organizations. Tociently operate arrive technology tocalls in the use of model. The course can be computational think KZ	4 s on typographic 3 2 examples from h, etc) will be 2 sic commands 4 with deployment multiplexors, e will also cover ime on Internet, live real tasks 5 they will get and optimize the day for the ordern integration 4 the is furthermore per followed by 4 communication. sing, empathy 3

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 combinatorics. In contrast to	o the basic courses,	we approach the
issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some		,
with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretic	•	
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, op	timization and more.	Students will
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.	7.71/	4
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 Lebesgue integral. We the properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss		
the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples		n. we examine
	Z.ZK	4
NI-VYC Computability Classical theory of recursive functions and effective computability.	Z,ZR	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 scientific and	. – .	
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.		
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 cred		
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divi	•	
exceeds the academic year's dead-line.		
BI-ZS20 Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and	or research institutio	n. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the pro	fessional 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 cred	lits correspond to 4 w	eeks 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 divi	ded into two subjects	if the internship
exceeds the academic year's dead-line.		
BI-ZS30 Bachelor internship abroad for 30 credits	Z	30
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and	or research institution	n. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content.	fessional content and	l 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 cred	•	
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divi	ded into two subjects	if the internship
exceeds the academic year's dead-line.	1/7	
BI-ZIVS Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The a		
modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motio		0
interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to technologies.	o get practical experi	ence with these
	1/7	4
BI-ZPI Process engineering Students will have fundamentals of process engineering in this publicat. Students will get accessory foundations for understanding formal principle.	KZ	•
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principl learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling	•	
CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of	•	•
an enterprise.	illioittiation and busin	less strategy or
BI-ZNF PHP Framework Nette - basics	KZ	3
DI-ZINF POP FIAMEWORK NELLE - DASICS Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Cz		_
students will gain the basics of PHP framework Nette. They will learn now to practically work with MVP architecture and various libraries of this C2 knowledge should serve for the efficient creation of a web backend in PHP language.	eon popular framewo	in. The resulting
BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.	NZ	4
'	7 71/	4
BI-ZWU Introduction to Web and User Interfaces	Z,ZK	4

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 group:

inote on the g	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-AG2.21	Algorithms and Graphs 2 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	V
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	٧
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 Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	Hardware Security 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 Kleprlik, 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 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 íha 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 (Gar.)	Z,ZK	5	2P+1C	L	V
BI-PPA.21	Programming Paradigms Jan Janoušek, Tomáš Pecka, 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 Ślapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	V
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-SIP.21	Network Programming Jan Fest Jan Fest (Gar.)	Z	5	2P+2C	Z	V
BI-SWI.21	Software Engineering Michal Valenta, Ji i Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	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 lohoubek, 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, Ji í Dan ek, Raian Samerkhanov Stanislav Kuznetsov	Z,ZK	5	2P+2C	Z	V
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	Z	V
BI-TIS.21	Information Systems Pavel Náplava 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 David Bernhauer David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák David Pokorný Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	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 (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 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

BI-BIG.21 DB Technologies for Big Data **K7** Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice.

BI-TAB.21 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

Z,ZK

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

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.

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

Applied Network Security BI-ASB.21

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.

Secure Code

The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.

BI-EPP.21 **Economic Business Processes**

Z,ZK

The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination.

BI-EHA.21 Ethical Hacking

Z.ZK

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

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.

	ogramming Languages and Compilers	Z,ZK	5
•	ng methods of programming languages. They are introduced to intermediate representations used in current compilers G		,
•	anslation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification ge but any text in a language generated by a given LL input grammar.	. The compiler car	i translate not
	ogramming Paradigms	Z,ZK	5
	paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paradigms of high-level programming languages.		hes. Functional
	its basic principles are explained in details. Logic programming is introduced as another way of declarative programming.		
on lambda calculus and on L such as C++ and Java.	Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main:	stream programm	ing languages
	ogramming of Graphic Applications	Z,ZK	5
	ossibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and th		-
data (3D scenes, mathemati	cal 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		147	
· ·	vaScript Programming n to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code develo	KZ	5 int easier
	thon Programming	KZ	5
1 -	jet acquainted with basic efficient control and data structures of the Python programming language for text and binary da	1	-
· · · · · ·	amming in Python and in other programming languages will be explained. Each topic is prepared for students in the form		
•	dividual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semest	er work will be ass	signed during
the semester. BI-PRR.21 Pro	picet management	7 71/	5
1 '	Digect management Introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, and	Z,ZK alvsis. crisis mana	
	umentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk a	-	-
	dule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for s		
	outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in la	arge companies. T	he course is
	o will develop software or hardware in the form of team projects. stwork Programming	Z	5
-	ntal topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level progr		-
	signing communication protocols and their verification. The third part introduces the principles and applications of middle		
	dels of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in co	mputer labs using	a chosen
programming language envir		7.71/	
	ftware Engineering h methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	Z,ZK	5 practically verify
- '	nalysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hanc		
using the visual language UN	ML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design	n and testing. With	nin the course,
	ical basis in the field of project management, estimation of costs of software projects, and methods of their development.		_
l l	am Software Project 1	KZ	5
	erience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the es students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The tea		
•	sults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software		
and finished in the BIE-SP2	course.	<u>.</u>	
	am Software Project 2	KZ	5
	erience with the iterative development process while working on a large-scale software project. The first iteration is the res he functionality, testing, and documentation of the software system being developed will be emphasized. Students will wo		
•	am and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their so		people. The
	achine Learning 1	Z,ZK	5
The goal of this course is to	introduce students to the basic methods of machine learning. They get theoretical understanding and practical working k	nowledge of regre	ession and
	supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationsl	•	
	amentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensio I scikit libraries in Python will be used.	nai data visualiza	lion. In practical
	achine Learning 2	Z,ZK	5
The goal of this course is to	introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in		ernel methods
	unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction meth	ods. Moreover, st	udents get the
	nent learning and natural language processing.	7 71/	
	achine vision and image processing ing a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate	Z,ZK	5 In The course
	ent types of camera systems and a variety of methods for image and video processing. The course is focused on practical u	-	
problems of practice that the	graduates may encounter.		
	al-time systems	Z,ZK	5
	nowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue		- 1
course.	lly verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab	are the same as I	n the BIE-VES
	va Technology	Z,ZK	5
l l	edge and skills for developing information systems and applications through concepts used in software development and e		
	em. At the course end, the students are able to develop software systems in Java platform.		
	mputer Networks Technologies	Z,ZK	5
	ents with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physi de theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective techn	=	· · · · · · · · · · · · · · · · · · ·
	s students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethe	•	
always with focus on high-sp		<u> </u>	

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

			0.00
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 I	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	automata, 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.	ı	·
BI-ACM2	Programming Practices 2	KZ	5
'	This is a selective course for preparing talented student for representation in international programming contests.		ı
BI-ACM3	Programming Practices 3	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM4	Programming Practices 4	KZ	5
'	This is a selective course for preparing talented student for representation in international programming contests.	1	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 kno specific examples from practice.	owleage from the le	ectures on
BI-ADW.1	Windows Administration	Z,ZK	4
DI-ADVV. I	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,Zr\	4
BI-AG1.21	Algorithms and Graphs 1	Z,ZK	5
	rs the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cur		-
	vledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the		
algo	rithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics in particular, and the particular mathematics in the particu	nptotic notation.	
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		
delves into advan	ces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Engl	ish version of the c	ourse see
DI ALO	BIE-AG2.21.	7.71/	4
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AND.21	Programming for the Android Operating System	KZ	4
DI-AND.ZI	This course is presented in Czech.	KZ	4
BI-ANG	English Language, Internal Certificate	ZK	2
DITTIO	Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN		_
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK	English language, contact preparation for the B2 level exam	7	2
_	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement -	students are due t	
	language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both th		
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-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
	n 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 processing and on the memory ineracing, students will understand the basic concepts of NGC and GIGC architectures and the printer r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of	-	1
	se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe	-	
	systems.		
BI-ARD	Interactive applications on Arduino	KZ	4
-	ned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat	· · · · · · · · · · · · · · · · · · ·	-
	arried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s		
not only on displa	ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students.	is suitable even for	vveb and
BI-ASB.21	Applied Network Security	Z,ZK	5
	rise 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
· · · · · · · · · · · · · · · · · · ·	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so		- 1
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	ion.org>)
DI MMD 04	that make understanding the principles of algorithms easy.	7.71	
BI-AWD.21	Web and Database Server Administration equainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and because of the configure of the configuration of the configurati	Z,ZK	5
•	ice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam		
BI-BAP.21	Bachelor Thesis	Z	14
BI-BEK.21	Secure Code	Z,ZK	5
	arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa		-
	gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		٠ .
administrator priv	ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing	data and the relation	onships of
<u>-</u>	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and th		them.
BI-BIG.21	DB Technologies for Big Data	KZ	5
	roduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is for	-	
=	e students were able to choose suitable tools (mostly open source) and techniques,design and implement a simplest reproducible me mation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretic	· ·	
	of individual technologies will be supplemented with specific examples from practice.		. 500111011011
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		
	semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at the state of the first the state of the state of the first the state of t		
=	enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvul		
me completed and	I 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	no or the work triat	ine 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 assignance can be supplemented and approved at the end of the semester.	nment so that the a	ssignment
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		dents to
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class.	
BI-CS1 Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co		
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defi		
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging well as work with files are emphasized.	and exception proc	essing, as
	KZ	4
BI-CS2 C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micros		-
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.	-	
of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (L	_	
and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data u	•	
(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	d Mapping
(XML description).		
BI-CS3 Language C# - design of web applications	KZ	4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of	f the development p	ossibilities
on thisplatform. They will learn to create WebAPI and to use it by client programs.		
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	-	
(including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the		
its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundar		
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		_
in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of datab optimizing database applications, distributed database systems, data stores.	ase systems, debu	ggirig ariu
BI-DML.21 Discrete Mathematics and Logic	Z,ZK	5
Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from		_
Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course		-
combinatorics and number theory, with emphasis on modular arithmetics.	,	
BI-EHA.21 Ethical Hacking	Z,ZK	5
The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulne	erabilities, 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 experi	ence 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 sys	tems which are cor	nnected to
a database and are accessed through the web interface.	7.71	
BI-EJK Enterprise Java and Kotlin The course is on advanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise informati	Z,ZK	4
architecture, that can be deployed to the cloud.	on systems with mi	croservice
BI-EP1.24 Effective programming 1	KZ	4
The course is taught in Czech.	INZ.	7
BI-EP2 Efficient Programming 2	KZ	4
Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individuals		iscussed,
with the aim to choose the best one and avoid implementation errors.		
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	f 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 labo	or costs, to
evaluating the financial health of the company and its eventual rehabilitation or termination.		
		5
BI-FBI.21 Financial Business Intelligence	Z,ZK	
The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business	analysis, determinir	ng its value
The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is man	analysis, determinir	ng its value g as a tool
The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is man for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business development.	analysis, determinir agement accountin business activities o	ng its value g as a tool ver several
The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is man for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business development. Accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and	analysis, determinir agement accountin ousiness activities o I to use value inforn	ng its value g as a tool ver several nation to
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BI-GIT.21	SW Development Technologies	Z	3
This course is aime	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to 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
BI-HAM	HW accelerated network traffic monitoring	KZ	4
	duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The	•	•
	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a so goals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic level and to develop their practical abilities in this field.		
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
This course is for	students interested not only in technical scope of computer science, but also in making products usable - for users and for developers use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.	. Students of this	course can
BI-HMI	History of Mathematics and Informatics This course is presented in Czech.	Z,ZK	3
BI-HWB.21	Hardware Security	Z,ZK	5
	ith hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operation		
-	eatures of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including ap	_	
DI 100 04	for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.	7 714	
BI-IDO.21	Introduction to DevOps	Z,ZK	5
	with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of syston Is support software development, testing and compilation. It also focuses on tools for automating infrastructure management and buildi		
	introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquainte used in practice.		
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech.	KZ	4
BI-IOT.21	Internet of Things	Z,ZK	5
	s on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overv		
	ication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architec computer labs, students will gain practical experience with developing simple IoT systems using common development environments (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 w		
_	nputer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate the design and control of the des	-	
•	ne organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including Iel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of commu		
· · · · · · · · · · · · · · · · · · ·	d the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micropro	· · · · · · · · · · · · · · · · · · ·	
	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		-
•	ems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in appli actical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic proced		
BI-KOM.21	Conceptual Modelling	Z,ZK	5
	Ised on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key ter	,	
	cify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological struct		=
-	learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representations.		-
	ns of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes.The DEMO m Il be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up co		MN notation
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 ully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a n		
The language is to	with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		Ciloriai way
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 diversity		mples from
anthropological res	search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, health shown. The course is presented in Czech.	, history, death, e	tc) will be
BI-LA1.21	Linear Algebra 1	Z,ZK	5
	students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimina		
	rith linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenv		•
	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 prost		
	ké s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafil	=	
	eární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat Ukážeme si také aplikace lineární algebry v r zných oborech.		
BI-LOG.21	Mathematical Logic	Z,ZK	5
	es on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability be of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are e		
-	and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and	· ·	
=	h to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness the		-

BI-MA1.21	Mathematical Analysis 1	Z,ZK	5
•	e by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. T f a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of function.		•
	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 The course comple	Mathematical Analysis 2 tes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learr	Z,ZK	ov parts and
	n method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the	-	
	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 F f localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integi		- 1
BI-MDF.21	Modern Data Formats	KZ	3
-	urse 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		
BI-MGA.21	e along with tools available to work with such data. After finishing the course, the students should know how to work with common da Multimedia and Graphics Applications	ta, e.g. on the Web	5
	uainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for worl		' !
	tion will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphics.		- 1
	r learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the p f graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating		on and use
BI-MIT	Mikrotik technologies	KZ	3
The main motivation	on of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are com	nmonly used by the	small and
	vice providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the mo trate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer ne	· •	
and now to adminis	and technologies of the data-link, network and transport layer of the OSI model.	etworks concepts in	ke protocois
BI-ML1.21	Machine Learning 1	Z,ZK	5
-	course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working ki		
	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	•	
	demonstrations, pandas and scikit libraries in Python will be used.		
BI-ML2.21	Machine Learning 2	Z,ZK	5
_	rurse is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in par ss. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methoc		
	basic principles of reinforcement learning and natural language processing.		one got and
BI-MMP	Multimedia team project	KZ	4
	This course is presented in Czech.		
DI MDD 24		7 71/	F
BI-MPP.21 The course is focus	Methods of interfacing peripheral devices	Z,ZK	5 The course
The course is focus		l serial bus (USB).	The course
The course is focus includes both PC s	Methods of interfacing peripheral devices ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa 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.	al serial bus (USB). 3 devices, Linux an	The course nd Windows
The course is focus includes both PC s	Methods of interfacing peripheral devices ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa 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	al serial bus (USB). B devices, Linux an	The course and Windows
The course is focus includes both PC s BI-MVT.21 The goal of the cou	Methods of interfacing peripheral devices ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa 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.	al serial bus (USB). B devices, Linux ar Z,ZK nented reality, visua	The course and Windows 5 alization on
The course is focus includes both PC s BI-MVT.21 The goal of the counting resolution disp	Methods of interfacing peripheral devices ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa 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 lays (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.	al serial bus (USB). B devices, Linux an Z,ZK mented reality, visual ad technologies, na	The course and Windows 5 alization on amely fractal
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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** 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. 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. Programing in PHP BI-PHP.1 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. **Programming Languages and Compilers** 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. 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-PJS.21 JavaScript Programming ΚZ 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 7.7K This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). **BI-PKM** Introduction to mathematics Ζ 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 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** 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. BI-PRR.21 Project management Z.ZK 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 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 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. BI-PSI.21 Computer Networks 5 The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. BI-PST.21 Probability and Statistics Z.ZK 5 Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical hypotheses and determining the statistical dependence of two or more random variables. BI-PYT.21 Python Programming K7 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. Quantum algorithms and programming Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on which quantum technologies are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development kit Qiskit, which is based

on Python language. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM a might be an advantage. No previous knowledge of physics is assumed.	and experience with	Python
BI-QUA Quality Assurance	KZ	4
This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of		
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should be		
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found in the SAR21.		
BI-SAP.21 Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithm	Z,ZK	5 rollers
nemory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple process		
in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.	. , ,	
BI-SCE1 Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to f		
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the sarticles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers semester.		
BI-SCE2 Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	failures and attacks.	Students
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the s	· ·	
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers	. The topics are new	for each
BI-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by cor		-
and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as in		
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discretization and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discretization and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discretization and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discretization and economic development, which are needed for the right investment decision.	cussions based on i	ndividual
BI-SIP.21 Network Programming	Z	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programm		
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware	-	-
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in comprogramming language environment.	iputer labs using a c	nosen
BI-SKJ.21 Scripting Languages	Z,ZK	4
Stripting Earliguages Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition		•
into shell and some other particular scripting languages and will get practical experience with shell script programming.	, , g	
BI-SOJ Machine Oriented Languages	Z,ZK	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use	of microprocessor's	features
and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view link	ked to higher level lar	nguages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	1/7	
BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	KZ	5 t runs
concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teache		
project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software arter	fact will be further de	eveloped
and finished in the BIE-SP2 course.		
BI-SP2.21 Team Software Project 2	KZ	5
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of		
However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work i teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of the team and project leader.		ne. The
BI-SPS.21 Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated	, i	
inux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by p		•
with real network infrastructure.		
BI-SQL.1 Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In part		
riggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and	•	
will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle	•	•
PostgreSQL.	22o and partia	, 511
BI-SRC.21 Real-time systems	Z,ZK	5
Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues.		
ectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are	the same as in the E	BIE-VES
course.		
BI-ST1 Network Technology 1	Z	3
The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited CCNA1 - R&S Introduction to Networks.	unuer the CISCO INE	iauau -
BI-ST2 Network Technology 2	Z	3
This course is presented in Czech.	- 1	•
BI-ST3 Network Technology 3	Z	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI-	l l	
get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predict	tability, extension be	yond a
simple topology, security, etc.		
BI-ST4 Network Technology 4	Z	3 ST1 and
Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching p BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficier	_	
5	,,,	

beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running. **BI-STO** Storage and Filesystems Z,ZK 4 The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling, load balancing and high availability. 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 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 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-TDA Test driven architecture ΚZ 4 The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are well known in the DevOps world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in the semester project. **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. TeX and Typography 7 7K **BI-TFX** 4 This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course focuses on typographic rules. BI-TIS.21 Information Systems Z.ZK 5 The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-TJV.21 Java Technology The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z.ZK 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TS1 4 Theoretical Seminar I 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-TS2 Theoretical Seminar II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TUR.21 User Interface Design Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. 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-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	ainted 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 function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the function of a transistor.	-	
limits to the maxim	num operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a con	nputer power supp	ly looks like
DI LIKE 04	(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.	7 71/	_
BI-UKB.21	Introduction to Cybersecurity	Z,ZK	5
The goal of the co	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 reg		cyberspace
BI-ULI	Introduction to Linux	Z	2
_	familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become	_	
	and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (te		
BI-UOS.21	Unix-like Operating Systems	KZ	5
	g systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative fu		
systems for comp	uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic proper	ties of this OS fami	ily, such as
processes and thre	eads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of	of advanced users	who are not
	e 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	
BI-VAK.21	Selected Applications of Combinatorics	Z	3
	p introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the b		
	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic		· · · · · · · · · · · · · · · · · · ·
	ticipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info		
will select probler	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimiz	ation and more. St	udents will
BI-VDC.21	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. Virtualization and Data Centers	Z,ZK	5
	Virtualization and Data Centers rse is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and		
	the as various kinds of virtualization and high availability of servers, storages, and software layers. The course quides through data cer	•	
,	rid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications.	Ü	
	ation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, o		
BI-VES.21	Embedded Systems	Z,ZK	5
Students learn to d	esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedd	ed processors, the	ir integrated
	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
BI-VHS	Virtual game worlds	ZK	4
The course leads s	tudents to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students to create a complex virtual world.	ents knowledge is	furthermore
complemented by	the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. T		followed 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
		, , , , , , , , , , , , , , , , , , , ,	
	an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understandi	_	
application in are	eas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocess	sing, and ways of v	/isualizing
application in are	• •	sing, and ways of v	/isualizing
application in are	eas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocess ata such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of examples in the Python programming language.	sing, and ways of viselected methods t	/isualizing
application in are different kinds of da BI-VMM	eas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocess at a such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of states.	sing, and ways of viselected methods to Z,ZK	visualizing to real-world
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DI 700 04		7 714	
BI-ZRS.21	Basics of System Control an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus	Z,ZK	5
	ering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description	•	
=	iic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating		
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
ontrol loops, issu	es of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial i	mplementation of	of continuou
	and digital controllers and PLC control.		
BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or res		
•	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profession y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corn		
	toreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	•	
	exceeds the academic year's dead-line.		
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or res	search institution	1
nternship the Dea	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profession	nal content and	extent of the
	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corre		
nployment with a	of 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 internsh
DI 7000	exceeds the academic year's dead-line.	_	
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or res an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio		
	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
	oreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	•	
, .,	exceeds the academic year's dead-line.	,	
BI-ZSB.21	Basics of System Security	Z,ZK	5
_	ourse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensi	,	-
uch as malware	analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern	n operating syste	ems securit
	as well as skills needed for independent work in the area of operating system security incident analysis.		
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
asic course on int	to direction to putitional list all acceptances and a least of the following of the least of the first and the trade in the contract of the first of	to croate it will I	ha dienueer
	troduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed		
especially at the o	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be	y a non-physical	
especially at the cas a	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be 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 of th	y a non-physical uring the course.	l entity, suc
especially at the o	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art dual lintroduction to Web and User Interfaces	y a non-physical	
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BIE-CSI his is an introduct science, high-schoand relate basic plone the way they	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be 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 due. Introduction to Web and User Interfaces This course is presented in Czech. Introduction to Computer Science tory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie ool students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go principles of computer science for students to understand, early on, what computer science is, why things such as high-level programm by are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interest.	y a non-physical ring the course. Z,ZK Z elds but intereste al of the class is ning languages at just basic comp	4 2 d in comput to introduce and tools are outer science.
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BIE-CSI his is an introduct science, high-sche and relate basic p done the way they uestions but also BIE-DIF	Introduction to Web and User Interfaces This course is presented in Czech. Introduction to Computer Science Toy class on Elementary Computer Science for broad audiences: bachelor students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go principles of computer science for students to understand, early on, what computer science is, why things such as high-level programm of are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interest than expected, or even less than before. Differential equations	y a non-physical uring the course. Z,ZK Z elds but intereste al of the class is ing languages at just basic computed in computer Z,ZK	d in compute to introduce and tools are outer science mo
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FIT-ACM2	Programming Practices 2 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
FIT-ACM3	Programming Practices 3 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
FIT-ACM4	Programming Practices 4	KZ	5
FIT 4 01 45	This is a selective course for preparing talented student for representation in international programming contests.	147	
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
with a very limited a	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	odern data or com	puting center
is understood here	e as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies. thus be capable of continuous and economically optimal operation.	The proposed solu	ution should
FIT-SEP	World Economy and Business	Z,ZK	4
This course is pre	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by c	omparing individu	al countries
	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as		
corruption and eco	nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of d	iscussions based	on individual
FITE FUD	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	7.71/	
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	uces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global ecc in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic		
	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institut	-	
	etailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and	-	
	meetings will consist of a mixture of lecture and discussion.		
NI-AFP	Applied Functional Programming	KZ	5
	sented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming paradigms.		_
the rise nowadays	s and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, maste necessary competence of a software engineer: the theory and especially the practice.	ring this paradigm	becomes a
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	•	-
data processing fra	amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations and the state of their parallel implementations are stated in the state of their parallel implementations are stated in the state of their parallel implementations are stated in the stated in	and will be capable	e to propose
All DOD	approaches to parallelize other algorithms. The course is prezented in czech language.	7.71/	
NI-DSP	Database Systems in Practes	Z,ZK	4
	This course is presented in Czech.	•	
NI-DZO		Z,ZK	4
	This course is presented in Czech. Digital Image Processing ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg		ı
This course prese	Digital Image Processing	gorithms that are b	ooth easy to
This course prese implement and hav of digital image p	Digital Image Processing 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 all processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR	gorithms that are be so valuable outsid compression, de-	ooth easy to le the domain blurring in
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This course prese implement and hav of digital image p frequency domain, interactive as-ri	Digital Image Processing ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms and interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is all processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray congid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a	gorithms that are be so valuable outsid compression, de- version, context er dding depth, alpha	both easy to le the domain blurring in hancement, a matting.
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This course prese implement and hav of digital image p frequency domain, interactive as-ri- NI-IAM The NI-IAM cours presentation of AV audiovisual transn	Digital Image Processing ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algority enteresting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is all processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray congid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a Internet and Multimedia see is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acc signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical missions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effection of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the for audience.	gorithms that are beso valuable outside compression, deversion, context endding depth, alpha Z,ZK quisition of AV signuse case scenario fect of various compressions and the context of th	obth easy to be the domain oblurring in hancement, a matting. 4 hals (input), s of real-time apponents on
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NI-PSD	Public Services Design	KZ	4
The course will in	troduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p	ocess 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 collaboration	with client repres	entatives.
	Course is aimed at students-designers as well as clients.		
NI-PSL	Programming in Scala	Z,ZK	4
	duces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature	• .	•
advance standard	library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and	libraries e.g. Play,	Cassandra
	Scalaz, etc.		
NI-REV	Reverse Engineering	Z,ZK	5
	acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before		
	s will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated	-	•
• • •	ritten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de		
debuggers and o	debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer	malware scene. I	ne focus of
NII 0) (D	the course is on the seminars, where students will solve practically oriented tasks from the real world.	7.71	
NI-SYP	Parsing and Compilers	Z,ZK	5
I he module builds	supon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	rious variants and	application
T OD	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.	7 714	
NI-TSP	Testing and Reliability	Z,ZK	5
•	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre		
tne intuitive path s	sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu will be able to compute, analyze, and control the reliability and availability of the designed circuits.	it-in-seir-test equip	ment. The
NILVOO		7.71/	
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
•	ain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	•	
•	arameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti		•
	omplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in		
a.iagoo.i. o. o.	and development tools (Continuous integration and development).		· ·····og·ao
NI-VYC	Computability	Z.ZK	4
141 710	Classical theory of recursive functions and effective computability.	2,210	•
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	,		
IVNZV	Physical Education Course	Z	0

Physical education

Physical education

For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2025-08-23, time 22:59.

TVV

TVV0