### Study plan

# Name of study plan: Bachelor Specialization Computer Networks and Internet, in Czech, 2021

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

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

Required credits: 153

Elective courses credits: 27 Sum of credits in the plan: 180

Note on the plan: Tato verze studijního plánu je ur ena pro ro níky, které byly p ijaty ke studiu od

akademického roku 2021/2022 do prezen ní formy studia bakalá ského programu. . Garant: Ing. Jan Fesl,

Ph.D., email: jan.fesl@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. If you plan to profile the specialization Artificial Intelligence or Web Engineering, enroll in the course BI-AAG.21 in

,	our 5th semester of study. Otherwise, enroll in the course BI- Name of the course / Name of the group of courses	. , , ,		1		
Code	(in case of groups of courses the list of codes of their	Completion	Credits	Scope	Semester	Role
BI-AG1.21	Algorithms and Graphs 1 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek <b>Dušan</b> Knop Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek <b>Jan Holub</b> Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BI-BPR.21	Bachelor project  Zden k Muziká Zden k Muziká (Gar.)	Z	1	0P+0C	Z,L	PP
BI-DBS.21	Database Systems Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, Pavel K íž, Št pán Pechman, Dominik Roudný, Jan Bittner, Ji í Hunka Michal Valenta (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Ji ina Scholtzová, Daniel Dombek, Jan Sp vák Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Ivana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BI-LA1.21	Linear Algebra 1 Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

BI-MA1.21	Mathematical Analysis 1 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-MA2.21	Mathematical Analysis 2 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BI-OSY.21	Operating Systems Petr Zemánek, Ji í Kašpar, Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík, Ladislav Vagner Pavel Tvrdík Michal Štepanovský (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI.21	Computer Networks Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, Josef Koumar, Petr Hoda, Josef Zápotocký, Michal Polák, Jan Fesl Jan Fesl (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-PST.21	Probability and Statistics Kamil Dedecius, Pavel Hrabák, Jitka Hrabáková, Petr Novák, Jana Vacková Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-PA1.21	Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Miroslav Balík, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BI-PA2.21	Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP.21	Computer Structure and Architecture  Hana Kubátová, Jaroslav Borecký, Petr Fišer, Martin Kohlík <b>Hana Kubátová</b> 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 <b>Martin Novotný</b> 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 The course covers the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It links and partially develops the knowledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the time and space complexity of algorithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic notation.

BI-AAG.21 Automata and Grammars Z,ZK Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions, and regular grammars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages

and they understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes P and NP. Bachelor Thesis BI-BAP.21 14

BI-BPR.21 Bachelor project Ζ

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 7.7K

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.

Discrete Mathematics and Logic

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

Cryptography and Security

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

Linear Algebra 1

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

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. 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. **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

BI-TDP.21

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-PS.21

Name of the group: Compulsory courses for specialization Computer Networks and Internet 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 <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	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-IOT.21	Internet of Things Viktor erný, Lenka Kosková T ísková Lenka Kosková T ísková (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	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-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	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

## Characteristics of the courses of this group of Study Plan: Code=BI-PS-PS.21 Name=Compulsory courses for specialization Computer Networks and Internet 2021

BI-ADU.21 Unix Administration

Z,ZK 5

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-APS.21 Architectures of Computer Systems

Z,ZK

5

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-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-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 programming using BSD sockets. The second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware technologies. The final part introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computer labs using a chosen programming language environment.

#### BI-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 under the operating systems Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by practical hands-on experience with real network infrastructure.

#### BI-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-VDC.21 Virtualization and Data Centers

Z.ZK

5

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

#### BI-VPS.21 Selected Topics in Computer Networking

Z.ZK

5 Smout

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.

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-PS.21

Name of the group: Compulsory elective courses of the specialization Computer Networks and Internet, version 2021

Requirement credits in the group: In this group you have to gain at least 5 credits (at most 15)

Requirement courses in the group: In this group you have to complete at least 1 course ( at most 3)

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-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	PV
BI-MSI.21	Mobile Networks Pavel Tvrdík	Z,ZK	5	2P+2C	L	PV
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=BI-PV-PS.21 Name=Compulsory elective courses of the specialization Computer Networks and Internet, version 2021

BI-EHA.21 | Ethical Hacking
The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation.

BI-MSI.21 Mobile Networks Z,ZK 5

The goal of the course is to acquaint students with basic principles of mobile networks 4G, 5G, and with multimedia data transfers in these networks. Also, students will study the principles of smart cards and their use for authentication of users of mobile networks. The computer labs will be based on simulations of mobile networks. The course builds upon preceding courses BIE-PSI and BIE-VPS and completes the overall student's knowledge mainly in the area of high-speed mobile networks.

BI-ML2.21 Machine 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 particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing.

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

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.21

Name of the group: Compulsory Physical Education, version 2021

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

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

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

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group:

BI-ANG, ending with an exam for two credits, is enrolled by students who have completed preparator English courses and have a credit from the BI-A2L course. <br/>
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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. <br/>
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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.

definition at the level of at least BZ according to the definition European's ramework 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

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2				
BIE-EEC	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	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  Biender  Lukáš Ba inka Lukáš Ba ink  NI-DSP  Database Systems in P  Tomáš Vickto Tomáš Vickto	(a. Lukáš Ba inka (Gar.)	Z,ZK	4		L	V
Tomás Viahia Tamás Viahia	ractes	Z,ZK	4	2P+2C 2P+1C	 	V
BI-STO Storage and Filesystem	Tomáš Vichta (Gar.)	Z,ZK	4	2P+2C	L,Z	V
NI DSD Public Services Design		KZ	4	1P+2C	ــ,ــ	V
David Pešek, Ond ej Brem David Pešek, Ond ej B	avid Pešek Ond ej Brém (Gar.) aldman, Ond ej Bouchala Tomáš Kalvoda	Z,ZK	5	2P+2C	L	V
NI-DZO Digital Image Processir	ng	Z,ZK	4	2P+1C	L	V
NI-DDM Distributed Data Mining	J	KZ	4	3C	L	V
BI-EP1.24 Effective programming Martin Ka er Martin Ka er	<b>1</b> Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2 Efficient Programming Martin Ka er Martin Ka er	2 Martin Ka er (Gar.)	KZ	4	2P+2C	L	V
	act preparation for the B2 level exam	Z	2	2C	Z,L	V
BI-EJA Enterprise Java  Ji i Dan ek	ra valenteva (ean.)	Z,ZK	4	2P+2C	L	V
BI-EJK  Enterprise Java and Ko  Ji í Dan ek Ji í Dan ek Ji	itlin	Z,ZK	4	2P+2C	L	V
BI-FMU Financial and Managem		Z,ZK	5	2P+2C	Z	V
RI_HAM HW accelerated networ	k traffic monitoring omáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI History of Mathematics Alena Šolcová Alena Šolcov	and Informatics	Z,ZK	3	2P+1C	L	V
Interactive applications	,	KZ	4	3C	L	V
NI-IAM Internet and Multimedia	1	Z,ZK	4	2P+1C	L	V
BIE-CSI Introduction to Comput	ter Science Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD Introduction to Europea Tomáš Evan		Z,ZK	3	2P+1C	L	V
BIE-IMA2 Introduction to Mathem	natics 2	Z	2	1C	Z	V
BI-CS2 C# language and data a Pavel Št pán Pavel Št pán		KZ	4	0P+3C	Z	V
BI-CS3  Language C# - design of Pavel Št pán Pavel Št pán	of web applications	KZ	4	3C	Z	V
BI-SQL.1 Language SQL, advanc	ed	KZ	4	3C	L	V
BI-QAP Quantum algorithms ar	nd programming	KZ	5	1P+2C	Z	V
NI-LSM Statistical Modelling La Kamil Dedecius Kami	ıb	KZ	5	3C	L	V
BI-HAS Human Aspects in Cryp	` '	Z,ZK	5	2P+1C	Z	V
NI-MPL Managerial Psychology Jan Fiala Jan Fiala Jan Fia	1	ZK	2	2P	Z,L	V
NI-MSI Mathematical Structure  Jan Starý		Z,ZK	4	2P+1C	L	V
BI-MPP.21 Methods of interfacing Miroslav Skribek Miroslav Sk	peripheral devices trbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MIT Mikrotik technologies Jan Fesl Jan Fesl Jan Fesl		KZ	3	1P+2C	Z	V
	d Programming in Pharo	KZ	4	3C	Z	V
BI-MVT.21 Modern Visualisation Te	echnologies	Z,ZK	5	2P+2C	Z	V
RI_MMD Multimedia team project	. ,	KZ	4	3C	Z,L	V
	nd Linear Programming	KZ	5	1P+2C	L	V
NI-OLI Linux Drivers	ecký <b>Jaroslav Borecký</b> Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ACM Programming Practices Tomáš Valla V		KZ	5	4C	L	V
FIT-ACM1 Programming Practices Tomáš Valla	s 1	KZ	5	4C	L	V
FIT-ACM2 Programming Practices Ond ej Suchý	3 2	KZ	5	4C	Z	V

BI-ACM2	Programming Practices 2	KZ	5	4C	Z	V
FIT-ACM3	Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)  Programming Practices 3	KZ	5	4C	L	V
BI-ACM3	Ond ej Suchý  Programming Practices 3	KZ	5	4C	L	V
FIT-ACM4	Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)  Programming Practices 4	KZ	5	4C	Z	V
BI-ACM4	Ond ej Suchý  Programming Practices 4	KZ	5	4C	Z	V
FIT-ACM5	Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)  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
	Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.)  Programming in C#					, v
BI-CS1	Pavel Št pán, Helena Wallenfelsová <b>Helena Wallenfelsová</b> 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 <b>Miroslav Balík</b> Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
BI-KOT	Programing in Kotlin Ji í Dan ek <b>Ji í Dan ek</b> Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	٧
NI-PSL	Programming in Scala Jií Dan ek <b>Jií Dan ek</b> Jií Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	٧
BI-PMA	Programming in Mathematica  Zden k Buk Zden k Buk Zden k Buk (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	٧
NI-PDD	Data Preprocessing Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-PKM	Introduction to mathematics Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z	4		Z	V
NI-REV	Reverse Engineering Josef Kokeš Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II  Hana Kubátová Hana Kubátová 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 (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3  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	Z,ZK	4	2+2	L	V
BI-SOJ	Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.)  Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
FIT-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers	Z,ZK	5	2P+1C	Z	V
BI-GIT	Jan Janoušek Jan Janoušek Jan Janoušek (Gar.)  Version control system GIT	KZ	2	16P	Z,L	V
BIE-SEG	Petr Pulc Systems Engineering	Z	0	2C	Z	V
TVK1	Christoph Kirsch Christoph Kirsch (Gar.)  Physical Education		1		L,Z	V
TVV	Luboš Neuman Ji í Drnek (Gar.)  Physical education		0	0+2	Z,L	V
TV1	Physical Education  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 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	٧
BI-TDA	Test driven architecture  Marek Hakala	KZ	4	2P+1C	Z,L	٧
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	٧
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	KZ	4	3C	Z	V
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák (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 <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	٧
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl <b>Tomáš Vondra</b> Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	٧
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	٧
BI-VR2	Virtual reality II Petr Klán <b>Petr Klán</b> 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	٧
BI-ZS30	Bachelor internship abroad for 30 credits  Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	٧
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	٧
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V.2021 Name=Purely Elective Courses of Bachelor Programme Informatics, version from 2021/22 till 2024/25

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

BI-ADW.1	Windows Administration	Z,ZK	4
This course is present	ed in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-ALO The course extends a	Algebra and Logic and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AVI.21	Algorithms visually	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.o		-
	ing the principles of algorithms easy.	. 9,	,
BI-A2L	English language, preparation for the B2 level exam	Z	2
	rise corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme	1	
	uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
	rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by		
class of the term.	3, 100 co. 100	marriada, todono.	o aago
BI-APJ	Aplication Programming in Java	Z,ZK	4
	ed in Czech. Advanced technologies in Java.	Z,ZR	4
· · · · · · · · · · · · · · · · · · ·		V7	
NI-AFP	Applied Functional Programming	KZ	5
•	ed in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function		
•	I the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas	stering this paradig	m becomes a
<u> </u>	e of a software engineer: the theory and especially the practice.	7 714	
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	ed to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class		
	jent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	thms and the neur	al networks, will
be presented as well.			
BI-BLE	Blender	Z,ZK	4
	nowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those		
animation. It offers a d	omplete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphi	cs applications) co	urse.
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is present			
BI-STO	Storage and Filesystems	Z.ZK	4
	principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	1 ' 1	-
load balancing and his		aromving, ao oo ao	otorago ocamig
NI-PSD	Public Services Design	KZ	4
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		nt nuanana fuana th	
	ice students to specifics of UX, Service design and development for public sector. We will look into the design and development	-	
suppliers (devs and de	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati	-	
suppliers (devs and de Course is aimed at st	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration dents-designers as well as clients.	on with client repr	esentatives.
suppliers (devs and de	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati	-	
suppliers (devs and de Course is aimed at str	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration dents-designers as well as clients.	Z,ZK	esentatives.
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BI-HAM	HW accelerated network traffic monitoring	KZ	4
	s students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. T ndatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a	_	-
	s of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network ti		
	eir practical abilities in this field.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is present		, ,	
BI-ARD	Interactive applications on Arduino	KZ	4
The subject is designed	d for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple appli	ications for moder	n programmable
	peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded	•	
	a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	e is suitable even	for Web and
Software Engineering		7 714	
NI-IAM	Internet and Multimedia	Z,ZK	4
	focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes ac nals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic	-	
-	ons. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the		
	of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording		•
for audience.			•
BIE-CSI	Introduction to Computer Science	Z	2
This is an introductory	class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other	er fields but interes	ted in computer
science, high-school s	tudents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	goal of the class	s to introduce
•	ples of computer science for students to understand, early on, what computer science is, why things such as high-level progra		
	, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer	=	-
•	estions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inte	erested in compute	er science more
than expected, or ever		7.71	
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	s a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global electric As European equation have been deminent actors in this process it fragues producing the anti-process in the accordance.		-
	istory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econome to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial inst	=	_
•	d economic history of particular European countries but rather the impact of trade and role of particular events, institutions and		
	of a mixture of lecture and discussion.	2 0. ga2a01.0	o.o. y. O.aoo
BIE-IMA2	Introduction to Mathematics 2	Z	2
	extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are	- 1	· <del>-</del>
		re able to apply th	
examples.	sacra anomologo di didinonary fanoscino ana anom proportico. Gladonio andologiana badio mattoritatica principico ana anoj a	re able to apply th	om particular
		KZ	4
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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 of	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	r 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	-	
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 involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with practice and related bachelor, diploma, postgraduate our direct involved in the cooperation with the coopera		
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	-	
high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the menti	oned 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	g powerful proces	sors and FPGAs
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development	ent for master's st	udents. The
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience	ı.	
BI-ACM Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	'	
FIT-ACM1 Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	112	· ·
FIT-ACM2 Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	, INZ	3
	1/7	_
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.		
BI-ACM4 Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	'	
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.		Ū
BI-AND.21 Programming for the Android Operating System	KZ	4
This course is presented in Czech.	NZ.	4
·	1/7	4
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		
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de		•
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggi well as work with files are emphasized.	ing and exception	processing, as
· · · · · · · · · · · · · · · · · · ·	7.71/	4
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	or this course in th	eir 4th semester
of study.		
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	a modern, object	-functional way
with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
NI-PSL Programming in Scala	Z,ZK	4
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 libraries e.g. l	Play, Cassandra,
Scalaz, etc.		
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 program	ımming, 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 a	and will use tool t	hat 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. Th	ney should
register for this course in their 3rd semester of study.		

BI-PS2 Programming in shell 2	Z,ZK	4
Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In a	ddition, they gain a	deeper insight
into shell and some other particular scripting languages and will get practical experience with shell script programming.  NI-PDD Data Preprocessing	7.71/	5
NI-PDD   Data Preprocessing Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various d	Z,ZK	
time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of charact		• • •
pages.		
BI-PKM Introduction to mathematics	Z	4
This course is presented in Czech.		
NI-REV Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is de-		
applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be		
debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compa	-	-
the course is on the seminars, where students will solve practically oriented tasks from the real world.		
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 resistant		
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of	-	
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 teasemester.	acners. The topics a	are new for each
BI-SCE2 Computer Engineering Seminar II	7	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 resistar		· .
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of		
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 tea	achers. The topics a	are new for each
semester.		
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 acred	ited under the Cisco	o Netacad -
CCNA1 - R&S Introduction to Networks.	Z	
BI-ST2   Network Technology 2 This course is presented in Czech.		3
BI-ST3 Network Technology 3	7	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented dur	ا ہے۔ ring BI-ST1 and BI-S	-
get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pr	_	
simple topology, security, etc.		
BI-ST4 Network Technology 4	Z	3
Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switch		-
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e	efficiency, predictabi	lity, extension
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complet	efficiency, predictabilities ely other type of ne	lity, extension twork (Non
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e	efficiency, predictabi ely other type of ne vitch firmware, perfo	lity, extension twork (Non erm password
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complet Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and sw	efficiency, predictabi ely other type of ne vitch firmware, perfo	lity, extension twork (Non erm password
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complet Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and sw recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the miti	efficiency, predictabi ely other type of ne vitch firmware, perfo	lity, extension twork (Non erm password
BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complet Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and sw recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitinetwork running.  BI-SKJ.21   Scripting Languages Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In a	efficiency, predictabilitiely other type of new ditch firmware, perfoligation ways while n	lity, extension twork (Non irm password naintaining the
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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 solventille papers and other achieving the treatment in the course is to course in focused or practical examples of how to device, test, and deploy software with tools like Gilt.ab. Docker, Kubernetes, and more that are well known in the DevOps world. This causes have a setting connection on courses like BIEE/SEI and BIEE/SEI. The main goal of this course is to learn by examples that cocur in the semester priest.  NITTED Testing and Reflability  Testing and Reflability  Shaders still gain knowledge should circuit testing and about methods for increasing reliability and security. They will get practical skills to the after to prepare a series with the help of the inclusive pasts securities.  PERCOLA  Quality Assurance  The course introduces students to the function that the securities of design and skyll state or correlate. They will be able to design analytic state or correlate. They will be able to design analytic state or correlate. They will be able to correlate the securities of different specification of the securities.  RECULA  Quality Assurance  This course introduces students to the function that they are applicable to the securities of different specification that they are applicable to the securities. At the end of the semester. The students in the course in different specification is securities and polymers are applicable to the properties as a specific to the still past of a securities. The subject of the securities of different specification is the securities of different specification. Willing specification are applicable to the properties of the securities of different specifications. The securities of different specifications are applications and the securities of different specifications. The securities of different specifications are a			Z	4
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The course is tocused on practical examples of how to develop, test, and deploy software with tools like Giltub. Docker, Kubernetes, and more that are well known in the DevCys world. This course has a strong connection on courses like Bill-PSIZ. The main geal of this course is to learn by examples that occurs is member project.  N-TSP  Testing and Reliability  A 2,ZK 5  Southers will gain knowwedge about circumstructuring and about methods for increasing reliability and security. They will gat practical skills to be able to operage a test set with the help of this intuitives path sensitization and to use an AFPS for automatic test generation. They will be able to design easily testable circuits and systems with bull-in-self-rest equipment. They will be able to progress and systems with bull-in-self-rest equipment. They will be able to design easily testable circuits and systems with bull-in-self-rest equipment. They will be able to design easily testable circuits and systems with bull-in-self-rest equipment. They will be able to design easily testable circuits and systems with bull-in-self-rest expectations. The self-rest in the cornect of design easily testable circuits and systems with bull-in-self-rest expectations. The self-rest in the cornect of the secretic state of the self-rest in the cornect of the secretic state of the self-rest in the cornect of the secretic state of the se			K7	4
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This course introduces students for the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of different type of software development and will experience hearborn application stering using both manual and automated stering. At the end of the semests, the student should be prepared to perform a sets analysis, design a set of lest sonarios, prepare lest data, automate an appropriate portion of the sonarios, and prepare a report on the bugs Durid in the product under test.  FI-TOP    Academic writing   Z   Z	'		built in boil tool t	quipmont: They
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should be prepared to perform a test analysis, design a set of test scenarios, prepare test data, submate an appropriate portion of the scenarios, and prepare a report on the bound in the product under test.  FI-TOP Academic writing Publishing is an important and requiring part of tesseron activity. It is not only about obtaining research results but alto about applying them in the form of publishoring writing scientific publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the course, students will learn how to write a scientific activitie, what parts such an article should have, and how the power review process works. Students will also try their hand at presenting an article and not enviewing someone also a strick. The course will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Dates will be determined based on the evaluation of exhibition of exhibitions are introductory deserted and controlled students.  BI-TEX  To Compiler Construction This is an introductory deserted on conception construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self compilation is the overacting them of the course forecessory spores in the source is presented. In Zech. However, there is an English variant in the program Informatics (B1801 / 4753).  BI-EHD  Introduction to European Economic History This course is presented in Zech. However, there is an English variant in the program Informatics (B1801 / 4753).  BI-LUL  Introduction to Circle.  BI-ULI  Introduction to Circle.  Introduction to Circle.  BI-ULI  Introduction to Circle.  Introduction	BI-QUA Quality A	Assurance	KZ	4
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found in the product under test.  FI-TOP  Pacidating is an important and required part of research activity, it is not only about obtaining research results but also about applying them in the form of publications. Writing a scientific publications can be useful for students on only in their compublishing activities but also in the preparation of a bachelor's or master's tenses. In the course, suitents will easily not the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course will be suggested to the extendition of the course of the class in the course will be suggested to the extendition of the course of the class.  BI-CCN  Compiler Construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching themse of the class.  BI-EDM  Introduction to European Economic History  This course is presented in Czech. This course gives bacics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). The second part of the course focuses on typographic rules.  BI-ESA  Introduction to European Economic History  The one-sensester course aims to accusally students with the begates of social and cultural anthropology as a scientific discipline dealing with the ofference of the course of the cours				
FI-TOP Academic writing Publishing is an improtant and required part of research activity. It is not only about obtaining research results but also about applying them in the form of publishing publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or muster's thesis. In the course, students will learn how to write a scientific article, what parts such an article should have, and how the peer review process works. Students will also by their hand at presenting an article and everying comeone are all to course with be taught in blocks, with on the learned and the peer review process works. Students will also by their hand at presenting an article and everying comeone are all to course with be taught in blocks, with on the learned based on the availability of enrolled students.  BI-TEX  Compiler Construction This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understant the design and implementation of programming languages. Seeing and auctually understanding self-compilation is the overarching themse of the class.  BI-TEX  To X and Typography  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-EHD  Introduction to European Economic History This course is presented in Czech. However, there is an English variant in the program informatics (61801 / 4753).  BI-KSA  Cultural and Social Anthropology  ZK  2  2  2  2  2  3  BI-TEX  To Cultural and Social Anthropology  City and the course focusion to the world - examples from anthropological research from our "exolic" cultures (topics: kinship, religion, social exclusion, migration, globalization, material culture, language, health, history, death, etc) will be shown. The course is presented in Czech.  BI-ULI  Introduction to Optical	I Total Control of the Control of th			
Publishing is an important and required part of research activity. It is not only about obtaining research results but also about applying them in the form of publishication. Such publishing activities but also in the preparation of a banchelor's or massites. In the course, suchests will late not wo write a scientific article, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an article and reviewing someone leads article. The sourse will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Dates will be determined based on the availability of enrolled shuddents.  BI-CCN Compiler Construction This is an introductory class on composite or structure to the same and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching thems of the class.  BI-EX TeX and Typography  BI-TEX TeX and Typography  Cazk 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 ruise.  BI-ED Introduction to European Economic History This ourse is presented in Czech. However, there is an English variant in the program informatics (B1801 / 4753).  BI-KSA Cultural and Social Anthropology The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the word - examples from our received cultures (posicis kinhipi, religion, social exclusion, migration, globalization, material culture, language, health, history, death, etc) will be shown. The course is presented in Czech.  BI-UI Introduction to Optical Networks  Sudants become familiar with basic or the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like syste				
write a scientific article, what parts such an article ahould have, and how the peer review process works. Students will allo try their hand at presenting an article and reviewing someone decès article. The course will be Inaught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Dates will be deleterable absed on the availability of enrolled students.  BI-CCN  Compiler Construction  Name of the course will be pauled in the semester. Dates will be deleterable as a considerable and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching them of the class.  TeX and Typography.  TeX and Typography  Z,ZK 4  This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). To second part of the course focuses on typographic rules.  BI-EFD  Introduction to European Economic History  Its course is presented in Czech. However, there is an English variant in the program Informatics (81801 / 4753).  BI-KSA  Cultural and Social Anthropology  The cone-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our 'cectic 'cultures (lopics: kinship, religion, social exclusion, migration, globalization, material culture, language, health, history, death, etc) will be shown. The course is presented in Czech.  BI-ULI  Introduction to Optical Networks  Sudents become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becomes a familiar with basic commands and techniques of a Univ-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (reminal).  BI-OPT  Introduction to Optical Networks  Sudents get basic overview of optical networking technology with the emphasis on practic	ļ ļ	•	rm of publication.	
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BI-VAK.21 Selected Applications of Combinatorics	Z	3
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In cont	rast to the basic courses, \	we approach the
ssue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce	some basic data structure	es. Furthermore,
with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only the	oretical) informatics. Areas	from which we
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithn	ns, optimization and more.	Students will
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		
BI-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. I	Ne then address Fourier se	eries and their
properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discrete		n. We examine
the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples are considered as a solution of the simplex algorithm.	mples.	
NI-VYC Computability	Z,ZK	4
Classical theory of recursive functions and effective computability.		
BI-ZS10 Bachelor internship abroad for 10 credits	Z	10
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific	c 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 th	e professional 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	) credits 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 b	e divided into two subjects	if the internship
exceeds the academic year's dead-line.		
BI-ZS20 Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific	c 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 th	e professional 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	credits 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	e divided into two subjects	if the internship
exceeds the academic year's dead-line.		
BI-ZS30 Bachelor internship abroad for 30 credits	Z	30
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific	c 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 th	e professional 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	credits 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 b	e divided into two subjects	if the internship
exceeds the academic year's dead-line.		
BI-ZIVS Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence.	The aim of the course is to	teach students
modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of	motion control, sensor read	ding, application
interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardw	vare to get practical experi-	ence with these
technologies.		
BI-ZPI Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal pr	inciples of process modell	ing and they will
learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and mode	elling of business processe	es using modern
CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall conte	ext of information and busing	ness strategy of
an enterprise.		
BI-ZNF PHP Framework Nette - basics	KZ	3
Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of the	nis Czech popular framewo	ork. The resulting
knowledge should serve for the efficient creation of a web backend in PHP language.	• •	ū
BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.	.=	•
BI-ZWU Introduction to Web and User Interfaces	Z,ZK	4
DI-ZWO Introduction to web and Ose Interfaces	۷,۷۱۸	-

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

3D Printing

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

ΚZ

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

This course is presented in Czech.

BI-3DT.1

Note on the group:

Note on the group	J.					
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 <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	٧
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	V
BI-AG2.21	Algorithms and Graphs 2 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek <b>Ond ej</b> 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 <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V

BI-APS.21	Architectures of Computer Systems	Z,ZK	5	2P+2C	Z	V
BI-BEK.21	Michal Štepanovský, Pavel Ťvrdík <b>Michal Štepanovský</b> Pavel Tvrdík (Gar.)  Secure Code	Z,ZK	5	2P+2C	L	V
BI-BIG.21	Josef Kokeš Josef Kokeš Josef Kokeš (Gar.)  DB Technologies for Big Data  Monika Borkovcová Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	V
BI-EPP.21	Economic Business Processes	Z,ZK	5	2P+2C	L,Z	V
BI-EHA.21	David Buchtela David Buchtela Tomáš Evan (Gar.)  Ethical Hacking	Z,ZK	5	2P+2C	L	V
BI-FBI.21	Ji í Dostál, Martin Kolárik, Andrej Šimko <b>Ji í Dostál</b> Ji í Dostál (Gar.)  Financial Business Intelligence	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	David Buchtela David Buchtela Petra Pavlí ková (Gar.)  Hardware Security	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Ji í Bu ek <b>Ji í Bu ek</b> Ji í Bu ek (Gar.)  Computer Units	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)  Conceptual Modelling	Z,ZK	5	2P+2C	Z	V
BI-LA2.21	Robert Pergl, Marek B lohoubek Robert Pergl Robert Pergl (Gar.)  Linear Algebra 2  Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek  Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	V
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MPP.21	Methods of interfacing peripheral devices  Miroslav Skrbek Miroslav Skrbek Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
FIT-ITI	Modern IT infrastructure  Ivan Šime ek	Z,ZK	5	2P+1C	Z,L	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 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 <b>Št pánka Havlíková</b> 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 <b>Jan Janoušek</b> Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	V
BI-PGA.21	Programming of Graphic Applications Ji i Chludil. Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	V
BI-PYT.21	Python Programming Martin Šlapák, 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-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	٧
BI-SPS.21	Administration of Computer Networks and Services  Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	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 <b>Jakub Novák</b> Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il <b>Jaroslav Borecký</b> 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 <b>Ji í Dostál</b> 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-TIS.21	Information Systems 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 (Gar.)	Z,ZK	5	2P+2C	Z	V
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	V
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák <b>David Pokorný</b> 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-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
BI-VPS.21	Selected Topics in Computer Networking  Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	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-ZSB.21	Basics of System Security Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	V
Characteristics of the Specialization BI-PS.	e courses of this group of Study Plan: Code=BI-PS-VO.21 Name: 21, version 2021	=Elective Vo	cational	Courses	for a Bac	helor
·	nix Administration			7	ZZK	5
	al structure of the UNIX operating system, with the administration of its basic subsystems	and with the sec	urity princip	l l	· .	-
	ator roles. They will get theoretical and practical knowledge of user management and ad			•		
	k services and remote access, and in the areas of system deployment and virtualization					
specific examples from prac	tice.					

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.

Virtualization and Data Centers BI-VDC.21

Z.ZK

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

Selected Topics in Computer Networking

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

Ethical Hacking

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

BI-ML2.21 Machine Learning 2 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. Methods of interfacing peripheral devices The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies Z,ZK BI-MVT.21 The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning. BI-AWD.21 Web and Database Server Administration Z,ZK 5 Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and backup complex database and web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server. BI-AG2.21 Algorithms and Graphs 2 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1.21. It further delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.21. 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. DB Technologies for Big Data BI-BIG.21 Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice. BI-EPP.21 **Economic Business Processes** Z,ZK 5 The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-FBI 21 Z,ZK Financial Business Intelligence The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-HWB.21 Hardware Security The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. BI-JPO.21 Computer Units Z,ZK 5 Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). Conceptual Modelling BI-KOM 21 Z,ZK 5 The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. BI-LA2.21 Linear Algebra 2 5 7.7K Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form . Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech. BI-LOG.21 Mathematical Logic Z,ZK 5 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	KZ	3
The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type a	and the data forma	ts 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.	
FIT-ITI Modern IT infrastructure	Z,ZK	5
with a very limited and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A		mputing 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		
thus be capable of continuous and economically optimal operation.	, .,	
BI-MGA.21 Multimedia and Graphics Applications	Z,ZK	5
Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for w		-
graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to		
technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the	• .	
of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.	.о ро.р.о о. оро.	
BI-OOP.21 Object-Oriented Programming	Z,ZK	5
Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth		-
		-
course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The e for developing software, which includes testing, error handing, refactoring, and application of design pattern.	ilipilasis is oli piac	licai tecririiques
	7 71/	
BI-PGR.21   Computer graphics programming	Z,ZK	5
After attending this curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design		- 1
geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		
such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe	_	-
professional development, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and st		
BI-PRS.21 Practical Statistics	KZ	5
The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose	_	
will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	are R and will app	ly the studied
methods on data from real problems.		
BI-PNO.21 Practical Digital Design	KZ	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 V	HDL 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 Law and Informatics	ZK	5
The aim of the course is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge		-
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 c	-	
environment, will know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able		
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		
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	-	
		5
BI-PJP.21   Programming Languages and Compilers Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers	Z,ZK	-
		*
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	n. The compiler car	i translate not
only a programming language but any text in a language generated by a given LL input grammar.	7.714	
BI-PPA.21   Programming Paradigms	Z,ZK	5
The course deals with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of		
programming paradigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming		
on lambda calculus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main	nstream programm	ing languages
such as C++ and Java.		
		5
BI-PGA.21 Programming of Graphic Applications	Z,ZK	
BI-PGA.21   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 the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the possibilities of current professional open-source tools for image editing, video editing, and the possibilities of current professional open-source tools for image editing the possibilities of current professional open-source tools for image editing the possibilities of current professional open-source tools for image editing the professional open-source tools for imag		ation of specific
	neir use for visualiz	
The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the course will present the course of the cou	neir use for visualiz	
The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and ti data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both usin by implementation of plugins.	neir use for visualiz	
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The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using by implementation of plugins.  BI-PJS.21 JavaScript Programming  The course is an introduction to Javascript programming. Students will also learn best practices and get acquainted with tools that make code developments.	neir use for visualiz g built-in scripting KZ lopment in Javascr	languages and 5 ipt easier.
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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 re	sult of the BIE-SP1	course project.
However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will we have been also as the state of the second of the sound of the sound of the sound of the second of the sound of the		people. The
teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their		
BI-ML1.21   Machine 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 classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relation		
variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimens	-	
demonstrations, pandas and scikit libraries in Python will be used.	onal data viodanza	iioni in pradildai
BI-SVZ.21 Machine vision and image processing	Z.ZK	5
Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evalua	1 ' 1	-
introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practica	use of camera sys	tems for solving
problems of practice that the graduates may encounter.		
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.		-
lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lal	are the same as i	n the BIE-VES
COURSE.	7.71	
BI-TAB.21 Applications of Security in Technology	Z,ZK	5
The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. St cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.	udents get a broad	er overview of
	7 71/	
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	Z,ZK	5
from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.	experience with it.	naries and tools
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 is to familiarise students with the information systems topic and information systems implementation principles.	1 1	
"on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and oth		
The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, was		-
implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analy	sis, customer insig	ht 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 informatic	n system impleme	ntation success.
At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems to	<del></del>	
BI-TUR.21 User Interface Design	Z,ZK	5
Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where sof	· · · · · · · · · · · · · · · · · · ·	
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	of methods that
bring users into the development process to ensure optimal interface for them.	7.71/	_
BI-TWA.21 Design of Web Applications  The basic source of web application development desirable the students become families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particularly statement as a second families with LITTR and its possibilities and particular statement as a second families with LITTR and its possibilities and particular statement as a second families with the second famili	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some proper	ties of language de	escribing the
structure (HTML) and procentation of document on the Web (CSS). These skills provide the processory basis for the development of Web application	oe which will be do	monetrated in
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BI-ZSB.21	Basics of System Security	Z,ZK	5
	se is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic	· · · · · · · · · · · · · · · · · · ·	-
	alysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern	=	
as well as skills need	ded for independent work in the area of operating system security incident analysis.		-
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
Basic course on intro	oduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed		e discussed,
especially at the dec	cision-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 e	ntity, such
as a virtual assistant	t 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 cour	se.	
	List of courses of this pass:		
Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A2L	English language, preparation for the B2 level exam	Z	2
	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement -	_	1
	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the		
	ss rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi		
	class of the term.		
BI-AAG.21	Automata and Grammars	Z,ZK	5
Students are introdu	iced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite a	utomata, regular	expressions,
and regular gramma	irs, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the	hierarchy of forma	al languages
	y understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity		
BI-ACM	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM2	Programming Practices 2	KZ	5
51 10115	This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM3	Programming Practices 3	KZ	5
DI AONA	This is a selective course for preparing talented student for representation in international programming contests.	1/7	
BI-ACM4	Programming Practices 4	KZ	5
DI ADILIOA	This is a selective course for preparing talented student for representation in international programming contests.	7 71/	
BI-ADU.21	Unix Administration	Z,ZK	5
	e internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They dministrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,		
	ry, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known	-	· ·
·	specific examples from practice.	_	
BI-ADW.1	Windows Administration	Z,ZK	4
'	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-AG1.21	Algorithms and Graphs 1	Z,ZK	5
The course covers	s the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cur	riculum. It links ar	nd partially
•	edge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the		omplexity of
	ithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics in particular, the asymptotic mathematics in particular, the asymptotic mathematics is a symptotic mathematics.	·	
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		
deives into advanc	es data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Engl BIE-AG2.21.	SIT VEISION OF THE	course see
BI-ALO	Algebra and Logic	Z,ZK	4
DI-ALO	The course extends and deepens the study of topics touched upon in the basic course in logic.	۷,۷۱۲	' '
BI-AND.21	Programming for the Android Operating System	KZ	4
5171115.21	This course is presented in Czech.		' '
BI-ANG	English Language, Internal Certificate	ZK	2
2.7	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	Z	2
	ourse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement -		1
	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both th		
tests with the succes	ss 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	uring 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
	the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec		
	processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the princessors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of	-	
	processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of a partner relaborates the principles and architectures of shared memory multiprocessor and multipore systems and the memory cohe.	-	

systems.

**BI-ARD** Interactive applications on Arduino ΚZ The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for modern programmable kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i.e. to see the results not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable even for Web and Software Engineering students. BI-ASB.21 Applied Network Security The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks. Algorithms visually The course complements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer science that extend substantially knowledge presented in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org<http://www.algovision.org&gt;) that make understanding the principles of algorithms easy. BI-AWD.21 Web and Database Server Administration 5 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-BAP.21 **Bachelor Thesis** 14 BI-BEK.21 Secure Code Z,ZK 5 The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. BI-BIG.21 DB Technologies for Big Data Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice. **BI-BLE** Blender Z,ZK The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in 3D graphics and animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course. Bachelor project 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-CCN Compiler Construction 5 This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing, constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized. BI-CS2 C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description). BI-CS3 Language C# - design of web applications The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on thisplatform. They will learn to create WebAPI and to use it by client programs. BI-DBS.21 **Database Systems** Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores. BI-DML.21 Discrete Mathematics and Logic Z,ZK 5 Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics. Z.ZK BI-EHA.21 Ethical Hacking The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-EHD Introduction to European Economic History Z,ZK 3 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).

BI-EJA The course is on a			
The course is on a	Enterprise Java	Z,ZK	4
	dvanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sys	tems which are co	onnected to
	a database and are accessed through the web interface.		
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
The course is on ac	dvanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise informati	ion systems with n	nicroservice
	architecture, that can be deployed to the cloud.		
BI-EP1.24	Effective programming 1	KZ	4
	The course is taught in Czech.		
BI-EP2	Efficient Programming 2	KZ	. 4 .
Continuation of Ef	ficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individ	dual problems are	discussed,
DI EDDO4	with the aim to choose the best one and avoid implementation errors.	7.71	_
BI-EPP.21	Economic Business Processes	Z,ZK	5
	rse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and		
	onment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the c se company, through the management of property and capital structure, financing of the company, determining the cost function of the		
Cotabilorinient of th	evaluating the financial health of the company and its eventual rehabilitation or termination.	company and lab	01 00313, 10
BI-FBI.21	Financial Business Intelligence	Z,ZK	5
	real is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business a		-
	s for comparison with other companies and management decision process at the tactical and strategic level. The second view is management	•	·
	ement and prediction of business development. Management accounting allows monitoring of the financial status and performance of b	•	•
accounting period	ds, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and	to use value infor	mation to
assess options rel	ated to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intel	lligence modules i	n business
	information systems, decision support systems, and other knowledge-oriented systems.		
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	t contains a gener	al overview
	of fundamental microeconomic and macroeconomic topics.		
BI-FMU	Financial and Management Accounting	Z,ZK	5
	rse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the par	-	-
•	unts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification		
of economic oper	ations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manager	ment accounting a	re base of
DI OIT	Business Inteligence moduls in Business information systems.	1/7	
BI-GIT	Version control system GIT	KZ	2
	troduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and praction plementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s		-
BI-GIT.21		Z	3
	SW Development Technologies dat one of the rudimental team software development technology - version control. To be more specific, we will introduce students to		-
This course is aime	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		I
	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a so	_	- 1
for analysis). The g	oals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic	c on a hardware a	nd software
	level and to develop their practical abilities in this field.		
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
This course is for	students interested not only in technical scope of computer science, but also in making products usable - for users and for developers	s. Students of this	course can
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
	This course is presented in Czech.	_,	•
BI-HWB.21	Hardware Security	Z,ZK	5
The course deals w	ith hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operat	Z,ZK ting principles of cr	5 ryptographic
The course deals w modules, security fe	ith hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operate atures of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW res	Z,ZK ting principles of cr ources, including s	5 yptographic ide-channel
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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 app	,, , ,	
•	ents based on them and learn the basics of sale use of symmetric and asymmetric cryptographic systems and hash functions in app actical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic proce		
BI-KOM.21	Conceptual Modelling	Z,ZK	5
	ised on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key te	1 ' 1	
	cify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological struc		
-	learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data represent		- 1
	ns of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO r Il be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up o		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 advar	1 ' 1	
	illy Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a		
	with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages	).	-
BI-KSA	Cultural and Social Anthropology	ZK	2
	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversit	=	
anthropological res	search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, healt	n, history, death, et	c) will be
DL I A4 04	shown. The course is presented in Czech.	7.71/	
BI-LA1.21	Linear Algebra 1 students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	of real and comple	5 ov numbers
	fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimin		
	ith linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigen	,	<i>'</i>
	matrix. We will also demonstrate some applications of these concepts in computer science.		
BI-LA2.21	Linear Algebra 2	Z,ZK	5
	p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový pros		
	ké s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou graf eární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo áda	=	
bude numericka iiii	Ukážeme si také aplikace lineární algebry v r zných oborech.	i s u Tazemi na 102i	Nauy IIIalic.
BI-LOG.21	Mathematical Logic	Z.ZK	5
	is on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiabilit	1 ' 1	-
logical consequence	ce of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are	explained. This rela	tes to the P
· · · · · · · · · · · · · · · · · · ·	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
	se by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. If a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions.		
	ot-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and		
	ssue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical descript	· · · · · · · · · · · · · · · · · · ·	
BI-MA2.21	Mathematical Analysis 2	Z,ZK	6
· · · · · · · · · · · · · · · · · · ·	etes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learn	_	
	on method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the series are series as a series of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the series of the series	•	
	escribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, ar we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and h	-	
=	of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integral		-
BI-MDF.21	Modern Data Formats	KZ	3
The goal of the cou	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	the data formats u	sed for that
data typ	e along with tools available to work with such data. After finishing the course, the students should know how to work with common day	ta, e.g. on the Web	).
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
	uainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wor		
	ation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to gra y learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the		
	of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating		on and asc
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 cor	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 m		
and how to adminis	strate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer no	etworks concepts lik	ke protocols
DI MI 4 04	and technologies of the data-link, network and transport layer of the OSI model.	7.71/	
BI-ML1.21	Machine Learning 1 course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working k	Z,ZK	5
_	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 multidimensiona	•	
	demonstrations, pandas and scikit libraries in Python will be used.		
BI-ML2.21	Machine Learning 2	Z,ZK	5
_	purse is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in pa		
anu neurai networ	ks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction method	.s. ivioreover, stude	ms get the
	hasic principles of reinforcement learning and natural language processing		
BI-MMP	basic principles of reinforcement learning and natural language processing.  Multimedia team project	K7	4
BI-MMP	basic principles of reinforcement learning and natural language processing.  Multimedia team project  This course is presented in Czech.	KZ	4
BI-MMP	Multimedia team project		4 5
BI-MPP.21	Multimedia team project This course is presented in Czech.	Z,ZK	5
BI-MPP.21 The course is focus	Multimedia team project This course is presented in Czech.  Methods of interfacing peripheral devices sed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universation and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USI	Z,ZK al serial bus (USB).	5 The course
BI-MPP.21 The course is focus	Multimedia team project This course is presented in Czech.  Methods of interfacing peripheral devices sed on methods for interfacing of peripheral devices is focused on techniques based on Universa	Z,ZK al serial bus (USB).	5 The course

BI-MSI.21 Mobile Networks Z,ZK 5 The goal of the course is to acquaint students with basic principles of mobile networks 4G, 5G, and with multimedia data transfers in these networks. Also, students will study the principles of smart cards and their use for authentication of users of mobile networks. The computer labs will be based on simulations of mobile networks. The course builds upon preceding courses BIE-PSI and BIE-VPS and completes the overall student's knowledge mainly in the area of high-speed mobile networks. 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 augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning. BI-OOP.21 Object-Oriented Programming Z,ZK 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. Introduction to Optical Networks Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possible problems with deployment of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive components (optical fibres, multiplexors, dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems). The course will also cover the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as the accurate time on Internet, ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. Students will solve real tasks from practice. **BI-ORL** Operations Research and Linear Programming ΚZ 5 The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundamental optimization technique. Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as management) 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-PA1.21 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 Z,ZK 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). BI-PAI.21 Law and Informatics ZK 5 The aim of the course is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of doing business in the Czech Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding contracts in real and Internet environment, will know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to use commercial license types and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection against their misuse. Students will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of real cases from practice. BI-PGA.21 **Programming of Graphic Applications** Z,ZK The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their use for visualization of specific data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using built-in scripting languages and by implementation of plugins. BI-PGR.21 Computer graphics programming After attending this curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the scene, add textures imitating geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in computer graphics, such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing solid fundamentals for your professional development, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfaces, and scientific visualization. BI-PHP.1 Programing in PHP The course is taught in Czech.. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study. BI-PJP.21 Programming Languages and Compilers Z.ZK Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers GNU and LLVM. They learn to create a specification of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. The compiler can translate not only a programming language but any text in a language generated by a given LL input grammar. BI-PJS.1 JavaScript Programming ΚZ 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 Z,ZK 4 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). **BI-PKM** Introduction to mathematics Ζ 4 This course is presented in Czech. BI-PMA Z,ZKProgramming in Mathematica 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 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-PPA.21 **Programming Paradigms** Z,ZK 5 The course deals with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of particular approaches. Functional programming paradigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The principles are demonstrated on lambda calculus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstream programming languages such as C++ and Java. Project management BI-PRR.21 The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects. BI-PRS.21 **Practical Statistics** ΚZ 5 The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose models fitting the data. The course will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software R and will apply the studied methods on data from real problems. BI-PS2 Programming in shell 2 Z,ZK 4 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming. Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. BI-PST.21 Probability and Statistics Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical hypotheses and determining the statistical dependence of two or more random variables. Python Programming BI-PYT.21 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. **BI-QAP** Quantum algorithms and programming Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on which quantum technologies are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development kit Qiskit, which is based on Python language. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM and experience with Python might be an advantage. No previous knowledge of physics is assumed. BI-QUA **Quality Assurance K7** This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of different types of software development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should be prepared to perform a test analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found in the product under test. BI-SAP.21 Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithmetic-logic unit, controllers, memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple processor is practically implemented in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. BI-SCE1 Computer Engineering Seminar I Ζ The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. Computer Engineering Seminar II BI-SCE2 Ζ The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. **BI-SEP** World Economy and Business This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite. BI-SIP.21 Network Programming The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming using BSD sockets. The second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware technologies. The final part introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computer labs using a chosen programming language environment. BI-SKJ.21 Scripting Languages Z.ZK Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming.

BI-SOJ	Machine Oriented Languages	Z,ZK	4
	irse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view lir	•	
and omorom ocopo	This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	med to mg.rer level	iai igaageei
BI-SP1.21	Team Software Project 1	KZ	5
_	ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		
-	hat teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teach Llarly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software art		
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	and finished in the BIE-SP2 course.		
BI-SP2.21	Team Software Project 2	KZ	5
	ds-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result		
	ollow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work er, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects		eopie. i ne
BI-SPS.21	Administration of Computer Networks and Services	Z,ZK	5
	rse is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated	•	
Linux and Windows	s. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by with real network infrastructure.	practical hands-on	experience
BI-SQL.1	Language SQL, advanced	KZ	4
	ן n knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa		
	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of	•	
	exes, clusters, index-organized tables, and materialized views, as well as from the point of view query optimization. Execution plan an		
will be discusse	ed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora PostgreSQL.	icie Dbivi5 and par	ually on
BI-SRC.21	Real-time systems	Z,ZK	5
	he basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues.		
lectures will be exp	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are	e the same as in the	e BIE-VES
BI-ST1	course.  Network Technology 1	Z	3
	iented 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.		
BI-ST2	Network Technology 2	Z	3
BI-ST3	This course is presented in Czech.  Network Technology 3	7	3
	r enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during B		
	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predi		
	simple tendlems assurity - t-		
DI OT I	simple topology, security, etc.		
BI-ST4	Network Technology 4	Z	3 8I-ST1 and
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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-T.IV 21 Java Technology Z.ZK 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. Computer Networks Technologies The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TS1 Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. 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. 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 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 Z,ZK 5 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 Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-UKB.21 Introduction to Cybersecurity Z,ZK 5 The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations BI-ULI 2 Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal) BI-UOS.21 Unix-like Operating Systems K7 Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell BI-VAK.21 Selected Applications of Combinatorics The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BI-VDC.21 Virtualization and Data Centers The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses BI-VES.21 Embedded Systems Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. Virtual game worlds The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.

BEVIZ 21  Data Visualization  For course effers an everywise of the types and characteristics of data as ever early and an extraction in understanding data, the coverer and declaracteristics of data as ever early and the subsenting with the course, subsential to the included to explosation in areas such as data mining and marketine tearing. Which he course is subsential to the included to explosation of an animal part of visual rings of the subsential to the subsential data and the included to explosation of the included to the subsential data and the included to explosation of the included and explosation. We cannot explose the included and explosation of the included and explosation. We cannot explose the included and explosation of the included and explosation. We cannot explose the explosation of the included and explosation. We cannot explose the explosation of the included and explosation. We cannot explose the explosation will be included and explosation of the included and explosation. We cannot explose the explosation of the included and explosation will be included and explosation. We cannot explose the explosation will be included and explosation of the included and explosation. We cannot explose the explosation will be explosed and explosed and explosation of the included and explosation. We cannot explose the explosation will be explosed and explosed and explosation of the included and explosation of the included and explosation will be explosed and explosation of the explosation of the included and explosation of the included		
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procurements currently accounts of the count		
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networks from local area networks up to Internet, with house on southering, routing, security, and virtualstation. The emphases will be on gaining protection electrosis proportions recording protections recording protections recording protections account.  BI-VR1  Introduction to Virtual Reality (VR), virtual reality segmenting system and virtual reality restrictions activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared cool achieves.  BI-VR2  Introduction to Virtual Reality (VR), virtual reality section and characteristic activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared cool achieves.  BI-VR2  Introduction to Virtual Reality (L. The new course focuses on collisorative testines in educational virtual 3D worlds. It improves computational thinking, empathy and shared cool achieves.  BI-VWM.21  Saractivities (Introduction in virtual reality in the course Virtual Reality (L. The new course focuses on collisorative testines in educational virtual 3D worlds. It improves computational thinking and social field of available. The course Virtual Reality (L. The new course focuses on collisorative testines in education and the course virtual Reality (L. The new course focuses on collisorative testines in education and the course of the cour	BI-VPS.21 Selected Topics in Computer Networking Z,	ZK 5
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The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 30 words. It improves computational thinking, empathy and shared social activities.  BI-VR2	BI-VR1 Virtual reality I	Z 4
and shared social activities.  BI-VR2  Virtual reality II  Sominutation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avaitant. The objective is to develop applications for computor accessor and gamilication in various social metavorse and deskelop engines.  BI-VWM.21  Searching the Web and Multimedia Datablases.  Searching the Web and Multimedia Datablases.  Z.ZK 5  Subdents 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 total and hypotropic documents (the web pages themselves) and about feature correction from web pages. They get detailed and the temperature of the pages themselves and developed and the pages themselves and search feature and the pages themselves and the pages and about feature activation from web pages. They get detailed and the temperature of the pages and the page		
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Bi-VWM.21 Searching the Web and Multimedia Databases Z.ZK 5 Solvents got basic overview about search inchiniques in two were benrivment that is interpreted as a very large distributed and heterogeneous stronge of documents. The new documents (the web pages themselves) and about search control pages. They got desirable and applications of the pages of the pages of the pages. They got desirable databases (generally in collections of unstructured datal.) They also learn techniques for programming web search engines for the mentioned data types (Gournents).  Bi-ZVS Intelligent embedded system fundamentals course is boused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students of the control and discovered the pages of the pages of the course of the pages of the pa		develop applications
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Bi-ZIVS Intelligent Embedded System Fundamentals (accurse is focused on tispi-level technology embedded Systems integrating artificial intelligence. The aim of the course is to teach students noted metal development of applications in a graphical development of a policious in a graphical development of a policious in a graphical development of a policious interfaces, robot navigation and development tools. In labs, students program as et of basic task by using the robot simulator and real hardware to get practical experience with these technologies.  BI-ZNF   PHP Framework Nette - basics  BI-ZNF   PHP Framework Nette - basics  BI-ZPI   PHP Framework Nette - basics  BI-ZPI   Process angineering in this subject. Students will get necessary fundations for understanding formal principles of process modelling and they will be an absolute of process engineering in this subject. Students will get necessary fundations for understanding formal principles of process modelling and they will be a possible of process engineering in this subject. Students will get necessary fundations for understanding formal principles of process modelling and they will be a process and principles of process engineering for information systems development is discussed as well as its importance in the overall contact of information and branching of the process and properties of process engineering of process and properties of process engineering for information and process of the process and properties of systems models, and society of process engineering for information systems development is discussed as well as its importance in the overall contact of information and observation of the processor of the processor of the processor in the overall occurs of information and occurrence of the processor of the processor of the process		
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notern humanoid robic control and development of applications in a graphical development environment, Loctures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program as set of basic task by using the robot simulator and real hardware to get practical experience with these technologies.  BI-ZNF   PHP Framework Nette - Dasics   KZ   3    **Rudents will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language.  BI-ZPI   Process engineering   Process engineering   Process engineering   Process engineering   Process engineering   Process engineering in this subject. Students will get necessary foundations for understanding formal principles   RZ   4    **Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will are backed to the used notations (MLIA, BPNN, BORM). The focus in this subject less in training of practical skills of formalisation and modelling of business processes using modern DASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise.  BI-ZRS 21   Sample Process of Process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise.  BI-ZRS 21   Sample Process engineering in this subject is business. In the process of the pr		
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		course.

	Introduction to Web and User Interfaces This course is presented in Czech.	Z,ZK	4
BIE-CSI	Introduction to Computer Science	Z	2
	y class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie	_	_
	of students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go		-
	nciples of computer science for students to understand, early on, what computer science is, why things such as high-level programm		
•	are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no		
	uestions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interes	-	
uestions but also qu		sted in computer s	cience m
DIE DIE	than expected, or even less than before.	7.71	
BIE-DIF	Differential equations	Z,ZK	5
•	a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential so		•
•	eorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered wit		
	s, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicatior	· · ·	
partial differential e	quations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs	and PDEs, includ	ding implic
	and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-EEC	English language external certificate	Z	4
he BIE-ECC course	e can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Englis	sh comparable to	or exceedi
	the B2 level of the Common European Framework of Reference for Languages.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
	d extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	_	_
tadomo romoon amo	examples.	able to apply them	parou
DIE CEC	Systems Engineering	Z	0
BIE-SEG	, , ,	l	1
	ry class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of c		
•	ssor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking t		
understand the di	fference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor	ncurrency is, as of	oposed to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
tudents are introduc	ced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classica	al tasks from the a	reas of sta
pace search, multi-a	agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm	s and the neural r	networks, v
	be presented as well.		
FI-TOP	Academic writing	Z	2
ublishing is an impo	ortant and required part of research activity. It is not only about obtaining research results but also about applying them in the form of	ı of publication. Writ	ina scient <sup>i</sup>
	useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the cou		
	le, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an		
	purse will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Da		_
cise s article. The ce	on the availability of enrolled students.	ates will be detern	iii ica basc
EIT A ON 44		1/7	
FIT-ACM1	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM2	Programming Practices 2	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
	Programming Practices 3	KZ	5
FIT-ACM3	, and the second se	'	
FII-ACM3	This is a selective course for preparing talented student for representation in international programming contests.		5
<u>'</u>		K7	_
FIT-ACM3	Programming Practices 4	KZ	•
FIT-ACM4	Programming Practices 4  This is a selective course for preparing talented student for representation in international programming contests.	!	· 
<u>'</u>	Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5	KZ KZ	5
FIT-ACM4	Programming Practices 4  This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5  This is a selective course for preparing talented student for representation in international programming contests.	KZ	
FIT-ACM4	Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5	!	5
FIT-ACM4	Programming Practices 4  This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5  This is a selective course for preparing talented student for representation in international programming contests.	KZ	
FIT-ACM4	Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 6	KZ	
FIT-ACM4   FIT-ACM5   FIT-ACM6   FIT-ITI	Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 5 This is a selective course for preparing talented student for representation in international programming contests.  Programming Practices 6 This is a selective course for preparing talented student for representation in international programming contests.	KZ KZ Z,ZK	5
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	Database Systems in Practes  This course is presented in Czech.	Z,ZK	4
NI-DZO	Digital Image Processing	Z.ZK	4
-	ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algor	,	1 .
nplement and have	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als	o valuable outsid	de the domai
of digital image p	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR (	compression, de	-blurring in
	abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conve	•	•
interactive as-rig	gid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ad	ding depth, alph	a matting.
NI-IAM	Internet and Multimedia	Z,ZK	4
	se is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acqu	,	I
	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical us	-	
	nissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effe		
	ncy of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the		•
, ,	for audience.	•	
NI-LSM	Statistical Modelling Lab	KZ	5
	ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is pu		1
	on and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis	-	
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
_	gramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where it		1
	plex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills	•	
	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development ne	ŭ	•
	ing object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work or		
	ms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem	٠.	•
NI-MPL	Managerial Psychology	ZK	2
	<u> </u>		
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
Mathematical se	emantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	model of lambd	a calculus.
	Introduction to category theory.		
NI-OLI	Linux Drivers	Z,ZK	4
	g system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po	· ·	
	ability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developmen		udents. The
	urse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica		
NI-PDD	Data Preprocessing	Z,ZK	5
tudents learn to p	repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data so	ources, such as	mages, texts
time series, etc., a	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characterist	ics from images	or from web
	pages.		
	pagoo.		
NI-PSD	· -	KZ	4
NI-PSD	Public Services Design	KZ	
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For updated information see <a href="http://bilakniha.cvut.cz/en/FF.html">http://bilakniha.cvut.cz/en/FF.html</a> Generated: day 2025-08-23, time 21:15.