## Study plan

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

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

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

Required credits: 153

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

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

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

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 106

The role of the block: PP

Code of the group: BI-PP.21

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

2021

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

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

Credits in the group: 106

Note on the group:

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

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-AG1.21	Algorithms and Graphs 1 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek <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, <b>Ji í Hunka</b> Michal Valenta (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Ji ina Scholtzová, Daniel Dombek, Jan Sp vák Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Ivana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BI-LA1.21	Linear Algebra 1 Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

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

BI-AAG.21 Automata and Grammars

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

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

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

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

BI-DBS.21 Database Systems Z,ZK 5

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

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

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

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

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

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

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

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

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

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

Name of the block: Compulsory courses in the specialization

Minimal number of credits of the block: 40

The role of the block: PS

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

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

2021

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

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

Credits in the group: 40 Note on the group:

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

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

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

#### BI-AWD.21 Web and Database Server Administration

Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and backup complex database and

web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.

BI-APS.21 Architectures of Computer Systems

Z,ZK

Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such systems

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

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

## Introduction to DevOps

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

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

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

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

Z,ZK

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

### **BI-7SB 21** Basics of System Security

7 7K

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

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 5

The role of the block: PV

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

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

version 2021

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

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

Credits in the group: 5

Note on the group:

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

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

BI-BIG.21 DB Technologies for Big Data KZ 5						
Students will be introdu	ced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course	is focused practic	ally so that after			
finishing the course stu	dents were able to choose suitable tools (mostly open source) and techniques,design and implement a simplest reproducible	method of data p	rocessing (data			
collection, transformation	on/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theor	etical foundation a	and presentation			
of individual technologie	es will be supplemented with specific examples from practice.					
FIT-ITI	Modern IT infrastructure	Z,ZK	5			
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. Stu	dents get a broad	ler overview of			
cybersecurity application	ins and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.					
BI-VES.21	BI-VES.21 Embedded Systems Z,ZK 5					
Students learn to design	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, prog	ramming methods, and applications. They get practical skills with development kits and tools.					

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

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.24

Name of the group: Physical Education, version 2024

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

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

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

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group:

BI-ANG, ending with an exam for two credits, is enrolled by students who have completed preparator English courses and have a credit from the BI-A2L course. <br/>
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br> BI-ANG1, ending with an exam for two credits, is enrolled by students who prepared for the exam independently and do not have credit from BI-A2L. These students must complete a credit paper before their own exam. After passing the exam, the student will also 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.

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 ing Valentová Kate ing Valentová (Gar.)	ZK	2	2D	Z,L	PJ

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

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2			
BIE-EEC	English language external certificate	Z	4			
The BIE-ECC course ca	he 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

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-ALO	Algebra and Logic Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era Lud k Ku era (Gar.)	Z,ZK	4	2P+1C	L	V
BI-A2L	English language, preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V

BI-BLE	Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes Tomáš Vichta Tomáš Vichta Tomáš Vichta (Gar.)	Z,ZK	4	2P+1C	L	V
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
NI-PSD	Public Services Design David Pešek, Ond ej Brém David Pešek Ond ej Brém (Gar.)	KZ	4	1P+2C		V
BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1  Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	V
BI-ANGK	English language, contact preparation for the B2 level exam Kate ina Valentová (Gar.)	Z	2	2C	Z,L	V
BI-EJA	Enterprise Java Ji í Dan ek	Z,ZK	4	2P+2C	L	V
BI-EJK	Enterprise Java and Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-FMU	Financial and Management Accounting  David Buchtela	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics  Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Jan ezní ek, Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	V
NI-IAM	Internet and Multimedia Ji í Melnikov	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2	Z	2	1C	Z	V
BI-CS2	Karel Klouda  C# language and data access  Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	0P+3C	Z	V
BI-CS3	Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	3C	Z	V
BI-SQL.1	Language SQL, advanced  Michal Valenta Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	V
BI-QAP	Quantum algorithms and programming	KZ	5	1P+2C	Z	V
NI-LSM	Tomáš Kalvoda, Ivo Petr Ivo Petr Ivo Petr (Gar.)  Statistical Modelling Lab	KZ	5	3C	L	V
BI-HAS	Kamil Dedecius Kamil Dedecius (Gar.)  Human Aspects in Cryptography and Security	Z,ZK	5	2P+1C	Z	V
NI-MPL	Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)  Managerial Psychology	ZK	2	2P	Z,L	V
NI-MSI	Jan Fiala Jan Fiala Jan Fiala (Gar.)  Mathematical Structures in Computer Science	Z,ZK	4	2P+1C	L	V
BI-MPP.21	Jan Starý  Methods of interfacing peripheral devices  Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MIT	Mikrotik technologies	KZ	3	1P+2C	Z	V
NI-MOP	Jan Fesl Jan Fesl (Gar.)  Modern Object-Oriented Programming in Pharo  In Plini and Papert Power Power (Car.)	KZ	4	3C	Z	V
BI-MVT.21	Jan Blizni enko Robert Pergl Robert Pergl (Gar.)  Modern Visualisation Technologies  li i Chludil Petr Pous Petr Pous Petr Pous (Cor.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Ji í Chludil, Petr Pauš Petr Pauš (Gar.)  Multimedia team project  Zda ka pakaná Zda ka pakaná (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Zde ka echová Zde ka echová (Gar.)  Operations Research and Linear Programming	KZ	5	1P+2C	L	V
NI-OLI	Dušan Knop Dušan Knop Dušan Knop (Gar.)  Linux Drivers  Misseley State to Leveley Beyerla's Misseley State to (Con)	Z,ZK	4	2P+2C	L	V
BI-ACM	Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)  Programming Practices 1	KZ	5	4C	L	V
BI-ACM2	Tomáš Valla Tomáš Valla (Gar.) Programming Practices 2	KZ	5	4C	Z	V
BI-ACM3	Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)  Programming Practices 3	KZ	5	4C	L	V
DI-UOINIO	Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	r\Z		40	L	v v

BI-ACM4	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-AND.21	Programming for the Android Operating System  Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.)	KZ	4	3C	L	V
BI-CS1	Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán (Gar.)	KZ	4	3C	L,Z	V
BI-PJV	Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	٧
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	V
NI-PSL	Programming in Scala  Ji í Dan ek <b>Ji í Dan ek</b> Ji í Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Zden k Buk Zden k Buk Zden k Buk (Gar.)  Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2	Z,ZK	4	2P+2C	L	V
NI-PDD	Lukáš Ba inka  Data Preprocessing	Z,ZK	5	2P+1C	Z	V
	Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)  Introduction to mathematics	Z		2		-
BI-PKM	Tomáš Kalvoda <b>Tomáš Kalvoda</b> Tomáš Kalvoda (Gar.)		4		_	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 (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2  Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3  Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Network Technology 4 Alexandru Moucha (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	Z,ZK	4	2P+2C		V
	Tomás Evan World Economy and Business		-		-	
BI-SEP	Tomáš Evan <b>Tomáš Evan</b> Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers  Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-GIT	Version control system GIT Petr Pulc	KZ	2	16P	Z,L	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVK1	Physical Education  Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,Z	V
TVV	Physical education	Z	0	0+2	Z,L	V
TV1	Physical Education	Z	0	0+2	Z	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2	Physical Education	Z	0	0+2	L	V
TV2K1	Physical Education 2	 Z	1		L,Z	V
TVKLV	Physical Education Course	 	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
BI-TS1	Theoretical Seminar I		4	2C	Z	V
BI-TS2	Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)  Theoretical Seminar II		4	2C	L	V
	Dušan Knop, Ond ej Suchý, Tomáš Valla <b>Tomáš Valla</b> Ond ej Suchý (Gar.)  Theoretical Seminar III					-
BI-TS3	Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)  Theoretical Seminar IV	Z	4	2C	Z	V
BI-TS4	Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture  Marek Hakala	KZ	4	2P+1C	Z,L	V

NI-TSP	Testing and Reliability	Z,ZK	5	2P+2C	Z	V
	Petr Fišer Martin Da hel Petr Fišer (Gar.)  Quality Assurance				_	<u> </u>
BI-QUA	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	٧
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	V
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	V
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	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

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

TV1	Physical Education	Z	0
TVV	Physical education	Z	0
TVK1	Physical Education	Z	1
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKZV	Physical Education Course	Z	0
TVKLV	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	Algebra and Logic	Z,ZK	4
The course extends ar	nd deepens the study of topics touched upon in the basic course in logic.		
BI-AVI.21	Algorithms visually	Z,ZK	4

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-A2L English language, preparation for the B2 level exam		
	Z	2
The content of the course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievements active part in the language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
tests with the success rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by		
class of the term.	marrada todono.	o damig and mor
BI-APJ Aplication Programming in Java	Z,ZK	4
This course is presented in Czech. Advanced technologies in Java.	_,_,	•
NI-AFP Applied Functional Programming	KZ	5
This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function	1	_
the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas		
necessary competence of a software engineer: the theory and especially the practice.		
BIE-ZUM Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class	ssical tasks from th	ne areas of state
space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms are spaced as a comparison of the computing methods.	ithms and the neur	al networks, will
be presented as well.		
BI-BLE Blender	Z,ZK	4
The course extends knowledge of opensource program Blender from Bl-MGA (Multimedia and Graphics Applications) course. It is intended for those animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to Bl-PGA (Programming graphi		
		4
NI-DSP Database Systems in Practes This course is presented in Czech.	Z,ZK	4
BI-STO Storage and Filesystems	Z,ZK	4
The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	1 ' 1	
load balancing and high availability.	archiving, as so as	storage scaling,
NI-PSD Public Services Design	KZ	4
The course will introduce students to specifics of UX, Service design and development for public sector. We will look into the design and developme		•
suppliers (devs and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborations	•	
Course is aimed at students-designers as well as clients.		
BIE-DIF Differential equations	Z,ZK	5
This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essenti	al solution method	s like separation
of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered		
polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicati	-	
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD	Es and PDEs, incl	uding implicit
and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.	7.71	4
NI-DZO Digital Image Processing  This source process a comprehensive everyion of modern methods for interactive editing of digital images and video. It mainly deals with practical	Z,ZK	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that i	-	-
of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF		
frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of	•	-
interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a		t crimariocriticiti,
	dding depth, alpha	
NI-DDM Distributed Data Mining	KZ	
NI-DDM Distributed Data Mining Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand	KZ	a matting.
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation	KZ ds on experience	4 matting scale
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain han data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.	KZ ds on experience was and will be capa	a matting.  4 with large scale able to propose
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24 Effective programming 1	KZ ds on experience	4 matting scale
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24  Effective programming 1  The course is taught in Czech.	KZ ds on experience was and will be capa	a matting.  4 with large scale able to propose
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24	KZ ds on experience on and will be capa  KZ	a matting.  4 with large scale able to propose  4
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Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24   Effective programming 1  The course is taught in Czech.  BI-EP2   Efficient Programming 2  Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving with the aim to choose the best one and avoid implementation errors.	KZ ds on experience on sand will be capa  KZ  KZ  KZ  ividual problems a	a matting.  4 with large scale able to propose  4  4  4  are discussed,
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24	kZ ds on experience was and will be capa KZ KZ dividual problems a	a matting.  4 with large scale able to propose  4  4 are discussed,
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24	KZ ds on experience on and will be capa KZ KZ KZ kividual problems a	a matting.  4 with large scale tible to propose  4  4 are discussed,  2 due to: -Take an
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24	KZ ds on experience on an and will be capa KZ KZ ds on experience on an and will be capa KZ dividual problems and an analysis and an a	a matting.  4 with large scale lible to propose  4  4  4  are discussed,  2  due to: -Take an the final term
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain handata processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language.  BI-EP1.24	KZ ds on experience on an and will be capa KZ KZ ds on experience on an and will be capa KZ dividual problems and an analysis and an a	a matting.  4 with large scale lible to propose  4  4  4  are discussed,  2  due to: -Take an the final term
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BI-ARD Interactive applications on Arduino  The subject to design of first grade of bash less that yet a subject to design of the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of make and the students will leave he unto design of the students will be students.	KZ	4
The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple app kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedde		
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	•	
Software Engineering students.		
NI-IAM Internet and Multimedia	Z,ZK	4
The NI-IAM course is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes a	cquisition of AV sig	gnals (input),
presentation of AV signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practi	cal use case scena	arios of real-time
audiovisual transmissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the	effect of various co	omponents on
the quality and latency of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording	ng the scene up to	the presentation
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 oth		-
science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	-	
and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level progra		
done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer	•	•
questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are int than expected, or even less than before.	erestea in compute	er science more
	7 71/	2
FITE-EHD Introduction to European Economic History  The course introduces a colorion of the most from the European economic history. It gives the student basis knowledge shout forming of the global.	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history.		
area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial ins	•	•
does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions an	•	
meetings will consist of a mixture of lecture and discussion.	.u o.gaaoo	o.o.y. O.aoo
BIE-IMA2 Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a	1	<del>-</del>
examples.		
BI-CS2 C# language and data access	KZ	4
The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Mid	1 1	•
get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current te	•	
of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQ	-	
and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data	· ·	
(ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mo	odel, Storage Mod	el and Mapping
(XML description).		
BI-CS3 Language C# - design of web applications	KZ	4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overvi	iew of the developn	nent possibilities
on thisplatform. They will learn to create WebAPI and to use it by client programs.		
BI-SQL.1 Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language.	In particular stored	program unites,
triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of the course is dedicated to practical database optimization from the period of	oint of view of speci	alized database
structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan	n and possibilities o	of its. changes
will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Or	acle DBMS and pa	rtially on
PostgreSQL.		
BI-QAP Quantum algorithms and programming	KZ	5
Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic	cs, on which quanti	um technologies
Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developed.	cs, on which quanti lopment kit Qiskit,	um technologies which is based
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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 high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mapping of the content of the content of the mapping of the content of	•	
and procedural visualization, scientific data visualization, and 3D model scanning.	ieritionea technologie	s, namely nacial
BI-MMP Multimedia team project	KZ	4
This course is presented in Czech.	<u>'</u>	<u>'</u>
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 Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such a	· ·	ation technique.
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 comb	1 '	
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development	pment for master's st	tudents. The
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experie		
BI-ACM Programming Practices 1 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM2 Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	1 112	, 0
BI-ACM3 Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM4 Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-AND.21 Programming for the Android Operating System	KZ	4
This course is presented in Czech.	1 112	
BI-CS1 Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental forms are considered as a multi-language development platform.		
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class		•
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Deb well as work with files are emphasized.	ugging and exception	i processing, as
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 develop		
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 regis of study.	ter for this course in tr	neir 4th semester
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		constructions.
The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development	nt of a modern, object	t-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
NI-PSL Programming in Scala The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language	1 '	
advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful framework	٠.	· · ·
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 prect.), how to create dynamic interactive applications and visualisations, data processing and presentations.	ogramming, rule-base	ed programming,
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 practic	1	· ·
development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to regis	ster for BIE-TWA.1. T	hey 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. Ir into shell and some other particular scripting languages and will get practical experience with shell script programming.	raddition, they gain a	deeper msignt
NI-PDD Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various		1
time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of chara-	acteristics from image	es or from web
pages.	7	4
BI-PKM Introduction to mathematics This course is presented in Czech.	Z	4
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 happened to be acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happened to be acquainted with the essentials of reverse engineering of computer software.	1 '	
is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is		
applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also I		
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 con the course is on the seminars, where students will solve practically oriented tasks from the real world.	iputer maiware scene	e. THE TOCUS OF
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 resis	_	1
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Par		
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar	teachers. The topics	are new for each
semester.		

BI-SCE2   Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance 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 teachers.	•	
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 acredite	ed under the Cisc	o Netacad -
CCNA1 - R&S Introduction to Networks.		0
BI-ST2 Network Technology 2 This course is presented in Czech.	Z	3
BI-ST3 Network Technology 3	Z	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during	. – .	_
get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pre	dictability, extensi	on beyond a
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 switchi BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased eff		-
beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete	= =	=
Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and swit		-
recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitig	ation ways while r	maintaining the
network running.	7.71	
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 ad-	Z,ZK	4
into shell and some other particular scripting languages and will get practical experience with shell script programming.	dition, they gain a	deeper msignt
BI-SOJ Machine Oriented Languages	Z.ZK	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal	, ,	
and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of vie	w linked to higher	level languages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.		
FIT-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by		
and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of		
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	31 010000010110 200	ou on maividual
BI-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by	comparing indivi	dual 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		
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	of discussions bas	sed on individual
NI-SYP Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of		_
of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		• • •
BI-GIT Version control system GIT	KZ	2
Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pr		articular system
even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server		
BIE-SEG   Systems Engineering This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	Z Z	0
to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the content of the class of the class of the class and actually understanding virtualization is the overarching theme of the class. After taking the content of the class of the c	,	
understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co	-	
parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
TV2K1 Physical Education 2	Z	1
BI-TS1 Theoretical Seminar I	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		•
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	s a work with scie	ntific papers and
BI-TS2 Theoretical Seminar II	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	. – .	· ·
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		•
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS3 Theoretical Seminar III	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		•
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	s a work with scie	ntific papers and
BI-TS4 Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	. – .	· ·
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		•
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TDA Test driven architecture	KZ	4
The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur is		
NI-TSP Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to		_
the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with		-
will be able to compute, analyze, and control the reliability and availability of the designed circuits.		

BI-QUA Quality Assurance		KZ	4
This course introduces students to the fundamentals of testing and quality management. Students will leave the fundamentals of testing and quality management.			
development and will experience hands-on application testing using both manual and automated testing			
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios	arios, and prepare a report on the bugs found	I in the product un	der test.
FI-TOP Academic writing		Z	2
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 fo	rm of publication.	Writing scientific
publications can be useful for students not only in their own publishing activities but also in the preparat	ion of a bachelor's or master's thesis. In the o	course, students w	vill learn how to
$write\ a\ scientific\ article, what\ parts\ such\ an\ article\ should\ have,\ and\ how\ the\ peer\ review\ process\ works.$	Students will also try their hand at presenting	an article and rev	ewing someone
else's article. 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 dete	ermined based
on the availability of enrolled students.			
BI-CCN Compiler Construction		Z,ZK	5
This is an introductory class on compiler construction for bachelor students in computer science. The go	pal of the class is to introduce basic principle	s of compilers for	students to
understand the design and implementation of programming languages. Seeing and actually understand	ing self-compilation is the overarching theme	of the class.	
BI-TEX TeX and Typography		Z,ZK	4
This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt	, LaTeX, OpTeX, LuaTeX). Te second part of t	he course focuses	on typographic
rules.			
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 (B18	301 / 4753).	_,,	-
BI-KSA Cultural and Social Anthropology	,	ZK	2
The one-semester course aims to acquaint students with the basics of social and cultural anthropology	as a scientific discipline dealing with the dive		
anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration,	-	=	· ·
shown. The course is presented in Czech.	giobalization, , material baltaro, languago, ne	oditii, iilotory, dodt	11, 010) Will 50
BI-ULI Introduction to Linux		Z	2
Students become familiar with the basics of the Linux operating system using e-learning form. They lear	rn to work with the command line and becom	ı	
		e iaiiiliai wilii bas	sic commands
and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verific	ed in a virtual machine (terminal).	7.71	
BI-OPT Introduction to Optical Networks	<u> </u>	Z,ZK	4
Students get basic overview of optical networking technology with the emphasis on practical utilization in	· · · · · · · · · · · · · · · · · · ·	=	
of optical network technology and on their solutions. The course will include the history of optical comm			-
dispersion compensators, and others), and an overview of active components (optical switches and am		,	
the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attenti	on will also be paid to new applications, such	as the accurate t	ime on Internet,
ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical component	ents and on measurement of their parameters	s. Students will so	ve real tasks
from practice.			
NI-VCC Virtualization and Cloud Computing		Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers a	and computer infrastructure of companies and	d organizations. Ti	ney will get
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate con	nfiguration, testing and monitoring, and to effi	iciently operate ar	d optimize the
performance parameters of modern computer systems. Theoretically and practically, they will get acqua	inted with containerization as the most effect	ive technology too	lay for the
management of complex computer systems and with specific technologies of cloud systems. Finally, they	will learn the principles and gain practical ski	lls in the use of mo	dern integration
and development tools (Continuous integration and development).			
BI-VHS Virtual game worlds		ZK	4
The course leads students to create a complex virtual world. The course is a continuation of basic graphi	cal courses (MGA, PGR, BLE,). This current s	students knowledg	e 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 b	e followed by
the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment	t suitable for VR devices.		
BI-VR1 Virtual reality I		KZ	4
Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another of	bjective is to meet the rules and requirement		
The course focuses on the ways of teaching using virtual reality technologies and interactive activities in			
and shared social activities.	•	·	
BI-VR2 Virtual reality II		KZ	3
Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spat	ial computing and social life of avatars. The c		_
for computer science and gamification in various social metaverse and desktop engines.		,	
		Z	3
BI-VAK.21   Selected Applications of Combinatorics The course aims to introduce students in an accessible form to various branches of theoretical compute	r science and combinatorics. In contrast to the	I .	
·			* *
issue from applications to theory. Together, we will first refresh the basic knowledge needed to design a			
with the active participation of students, we will focus on solving popular and easily formulated problems			
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic g		ization and more.	Students will
also try to implement solutions to the studied problems with a special focus on the effective use of exist	rig tools.	7.71	
BI-VMM Selected Mathematical Methods	and the state of t	Z,ZK	4
The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next,			
properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the contract of the Discrete Fourier Transform (DFT) and it is a study to the Discrete Fourier Transform (DFT) and it is a study to the Discrete Fourier Transform (DFT) and it is a study to the Discrete Fourier Transform (DFT) and it is a study to the Discrete Fourier Transform (DFT) and the Discrete Fourier Transform (DFT) and the DFT		wavelet transforn	n. We examine
the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic	s demonstrated with interesting examples.		
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	n university or other foreign scientific and/or	research institutio	n. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The	student must provide evidence of the profess	sional content and	extent of the
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation	of the internship in IS KOS. Every 10 credits	correspond to 4 w	eeks of full-time
employment with a foreign institution. The maximum number of credits a student can earn for one intern	ship is 30 credits. This amount can be divided	d 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	n university or other foreign scientific and/or	ı	
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The	-		
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation			
employment with a foreign institution. The maximum number of credits a student can earn for one intern	-		
exceeds the academic year's dead-line.			- 2007
*			

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BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
	e within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or		
internship the Dean of	f the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profes	sional content and	d extent of the
	ourses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits	•	
employment with a for	eign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divide	d into two subjects	if the internship
exceeds the academic	c 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 rob	ot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion of	control, sensor rea	ding, application
interfaces, robot naviç	ation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to g	et practical experi	ence with these
technologies.			
BI-ZPI	Process engineering	KZ	4
Students will learn fur	damentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles	of process model	ing and they will
	damentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles and notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of	•	
learn basics of the use		business processe	es using modern
learn basics of the use	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of	business processe	es using modern
learn basics of the use CASE tools. The role	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of process engineering for information systems development is discussed as well as its importance in the overall context of information.	business processe	es using modern
learn basics of the use CASE tools. The role an enterprise. BI-ZNF	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of	business processormation and busi	es using modern ness strategy of
learn basics of the using CASE tools. The role an enterprise.  BI-ZNF Students will gain the	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of process engineering for information systems development is discussed as well as its importance in the overall context of information systems.  PHP Framework Nette - basics	business processormation and busi	es using modern ness strategy of
learn basics of the using CASE tools. The role an enterprise.  BI-ZNF Students will gain the	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of of process engineering for information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information phenomena in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development in the overall context of information systems development development is discussed as well as its importance in the overall context of information systems development developm	business processormation and busi	es using modern ness strategy of
learn basics of the use CASE tools. The role an enterprise. BI-ZNF Students will gain the knowledge should ser	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of of process engineering for information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development for information in the overall context of information and info	business processon and busi KZ h popular framewo	es using modern ness strategy of 3 ork. The resulting
learn basics of the use CASE tools. The role an enterprise.  BI-ZNF Students will gain the knowledge should ser BI-IOS	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of of process engineering for information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information systems development for information in the overall context of information and info	business processon and busi KZ h popular framewo	es using modern ness strategy of 3 ork. The resulting
learn basics of the use CASE tools. The role on enterprise.  BI-ZNF Students will gain the knowledge should ser BI-IOS This course is present	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of of process engineering for information systems development is discussed as well as its importance in the overall context of information systems development is discussed as well as its importance in the overall context of information of process engineering for information systems development is discussed as well as its importance in the overall context of information systems development.  PHP Framework Nette - basics basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czecl version for the efficient creation of a web backend in PHP language.  Fundamentals of iOS Application Development for iPhone and iPad ded in Czech.  Introduction to Web and User Interfaces	business processon and busing KZ h popular framewo	es using modern ness strategy of 3 ork. The resulting

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

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

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

Credits in the group: 0 Note on the group:

Note on the gi	oup.					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)					
BI-AG2.21	Algorithms and Graphs 2  Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek <b>Ond ej Suchý</b> 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-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	V
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	V
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-FBI.21	Financial Business Intelligence David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	Hardware Security Ji í Bu ek <b>Ji í Bu ek</b> Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B Iohoubek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-LA2.21	Linear Algebra 2 Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	V
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš 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 ( 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	٧
BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	V
BI-SWI.21	Software Engineering Michal Valenta, Ji í Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	V
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	V
BI-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Ji í Mlejnek Ji í Mlejnek (Gar.)	KZ	5	2C	Z	V
BI-ML1.21	Machine Learning 1  Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	٧
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 Iohoubek, 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 <b>Ji í</b> Dan ek	Z,ZK	5	2P+2C	Z	V
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	Z	V
BI-TIS.21	Information Systems Pavel Náplava Pavel Náplava (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-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-VIZ.21	Data Visualization  Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
BI-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal <b>Ji í Novák</b> 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	Z,ZK	5	2P+2C	Z	V
I-ZUM.21	Kate ina Hyniová Kate ina Hyniová Kate ina Hyniová (Gar.)  Artificial Intelligence Fundamentals	Z,ZK	5	2P+2C		V
	Pavel Surynek Pavel Surynek (Gar.)					
naracteristics of the	ne courses of this group of Study Plan: Code=BI-PV-VO.21 Name	e=Elective vo	cationa	I Courses	for a Bac	helor
	B Technologies for Big Data				۲Z	5
	I into the field of Big Data processing where nonrelational (NoSQL) database engines a		•		•	•
<del>-</del>	its were able to choose suitable tools (mostly open source) and techniques,design and aggregation, presentation). Students get acquainted with various architectures for proce		-		15	
	will be supplemented with specific examples from practice.	gg				
I-TAB.21 A	pplications of Security in Technology			Z	,ZK	5
-	introduce students to selected topics from cybersecurity technical applications that are			es. Students ge	et a broader	overview of
	and extend their knowledge from the cryptology, the secure code, and system, network	, and hardware se	ecurity.			
	mbedded Systems		trallara an		,ZK	5
-	nbedded systems and develop software for them. They get basic knowledge of the most nming methods, and applications. They get practical skills with development kits and too		itrollers and	а етвеааеа р	rocessors, ir	ieii integrati
· · · · · ·	lethods of interfacing peripheral devices			7	,ZK	5
ı	nethods for interfacing of peripheral devices. Interfacing of real peripheral devices is foci	used on technique	s based or			-
ncludes both PC side and	peripheral devices side. Labs are practically oriented. Students gain experience with im-	plementation of r	elevant par	rts of USB dev	ices, Linux a	and Window
	development, and APIs of selected devices.					
	lodern Visualisation Technologies				,ZK	. 5
•	o give an overview of modern visualization technologies and their principles, namely ted g., SAGE and video mapping) and their applications in practice. Several lectures deal wi	•		•	•	
	g., SAGE and video mapping) and their applications in practice. Several rectures dear wi on, scientific data visualization, and 3D model scanning.	in the content crea	ation for the	inentioned te	cririologies, i	namely hac
<u> </u>	Igorithms and Graphs 2			7	,ZK	5
	Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the	introduction giver	n in the con			1. It further
	structures and amortized complexity analysis. It also includes a very light introduction t	o approximation a	lgorithms.	For English ve	rsion of the	course see
BIE-AG2.21.						
	pplied Network Security	:	-1-11		,ZK	5
	introduce selected topics from computer networks in terms of cybersecurity. These top		sic knowied	age gained in d	course BI-PS	oi with actua
		or wireless netwo	orks After			nt will get
	ne public key infrastructure, encrypted network protocols, link and network layer security ications in computer networks.	or wireless netw	orks. After			nt will get
knowledge of security appl BI-BEK.21 S The students will learn how	ications in computer networks.  ecure Code  to assess security risks and how to take them into account in the design phase of their cical experience with running programs with reduced privileges and methods of specifyin	own code and solu	utions. After	finishing the co	,ZK ar with the th	5 reat modeli
Rnowledge of security appl BI-BEK.21 S The students will learn how heory, students gain pract administrator privileges. Da security and database syst	ications in computer networks.  ecure Code  / to assess security risks and how to take them into account in the design phase of their cical experience with running programs with reduced privileges and methods of specifying angers inherent in buffer overflows will be practically demonstrated. Students will be intricted, web, remote procedure calls, and sockets in general. The module concludes with	own code and solung these privilegesed oduced to the prince of the princ	utions. After s, since no nciples of s	finishing the control of the control	,ZK ar with the th m needs to r and the relati against ther	5 reat modeling the sum with sonships of m.
knowledge of security appl BI-BEK.21 S The students will learn how heory, students gain pract administrator privileges. Dasecurity and database syst BI-EPP.21 E The aim of the course is to	ications in computer networks.  ecure Code  y to assess security risks and how to take them into account in the design phase of their or ical experience with running programs with reduced privileges and methods of specifying angers inherent in buffer overflows will be practically demonstrated. Students will be introduced, remote procedure calls, and sockets in general. The module concludes with conomic Business Processes  present typical processes related to the usual life cycle of a company. The course focu	own code and solung these privileger oduced to the prince Denial of Service ses mainly on the	utions. After s, since no nciples of s attacks an basic ecor	r getting familiat every programe ecuring data and the defense	,ZK ar with the the meds to rand the relation against there.,ZK incial aspect	5 reat modeling with the conships of the m. 5 s of busines
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BI-KOM.21 The course is focused of			
The course is focused of	Conceptual Modelling	Z,ZK	5
	in developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key	terms in a domai	n, the ability to
categorize and specify	correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological st	ructural modeling	in the OntoUML
notation. Next, they lear	n how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data repres	entation in the Int	ernet. They also
learn the foundations of	enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEM	O method and the	BPMN notation
will be taught. The cour	se is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI.		
BI-LA2.21	Linear Algebra 2	Z,ZK	5
Studenti si v tomto p ed	m 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 p	rostor v abstraktn	í obecné form .
Seznámíme se také s p	ojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou gr	rafikou. Dalším ve	lkým tématem
bude numerická lineárn	í algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo á	idat s d razem na	rozklady matic.
Ukážeme si také aplika	ce lineární algebry v r zných oborech.		
BI-LOG.21	Mathematical Logic	Z,ZK	5
	the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiab		_
	formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, a		
	plean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and	-	
•	cal logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems		c symaciic
BI-MDF.21	Modern Data Formats	KZ	3
<del>-</del>	s to give an overview of commonly used data formats for typical types of data. There will be a description of each data type a		is used for that
	Is available to work with such data. After finishing the course, the students should know how to work with common data, e.g.		
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
• .	d with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wo		
	will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to		-
= -	n to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the	e principle of oper	ation and use
of graphics processing	cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.		
BI-OOP.21	Object-Oriented Programming	Z,ZK	5
	nming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togethe	, , , , , , , , , , , , , , , , , , ,	_
· · ·	uainted with the main principles of object-oriented programming and design, used in modern programming languages. The en		-
-	which includes testing, error handing, refactoring, and application of design pattern.		
BI-PGR.21	Computer graphics programming	Z,ZK	5
	e, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design		-
<del>-</del>			- 1
=	aterials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		
	ne, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe	-	-
	nt, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and su	1	
BI-PRS.21	Practical Statistics	KZ	5
The students will be intr	oduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose r	models fitting the o	lata. The course
will encompass regress	ion and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softwa	are R and will app	ly the studied
methods on data from r	eal problems.		
BI-PNO.21	Practical Digital Design	KZ	5
Students get an overvie	w of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the	ı he basics of the V	HDL language
_	hnologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		1
tools.		•	· ·
BI-PAI.21	Law and Informatics	ZK	5
	s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge		-
	rted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding co		
•	their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able	entracte in roal and	d Internet
environment, will know			
and anon source licens		to use commercia	al license types
· ·	es. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	to use commercian against their mi	al license types suse. Students
will also be alerted to s	es. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of	to use commercion against their mind freal cases from	al license types suse. Students oractice.
will also be alerted to s	es. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection ich behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of Programming Languages and Compilers	to use commercia on against their mi f real cases from Z,ZK	al license types suse. Students practice.
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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. Software Engineering Z,ZK BI-SWI.21 Students get acquainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They consolidate and practically verify their knowledge during the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-on experience with CASE tools using the visual language UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design and testing. Within the course, students also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their development. BI-SP1 21 Team Software Project 1 ΚZ 5 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the BIE-SWI course that runs concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software artefact will be further developed and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BIE-SP1 course project. However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their solution Machine Learning 1 The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional data visualization. In practical demonstrations, pandas and scikit libraries in Python will be used. BI-ML2.21 Machine Learning 2 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. Machine vision and image processing Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate image information. The course introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use of camera systems for solving problems of practice that the graduates may encounter. Real-time systems Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are the same as in the BIE-VES course Java Technology BI-TJV.21 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z.ZK The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TIS.21 Information Systems Z.ZK 5 The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. User Interface Design 7.7K 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. Introduction to Cybersecurity The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations. BI-VIZ 21 **Data Visualization** ΚZ 5 The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language 5 BI-VWM.21 Searching the Web and Multimedia Databases Z,ZK Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents)

BI-FEM.21	Fundamentals of Economics	Z,ZK	5
	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management.	, i	_
	roeconomic and macroeconomic topics.	n comanio a gonor	ui 0 voi vio v
BI-ZRS.21	Basics of System Control	Z,ZK	5
	n introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus		cularly on
control of engineeri	ng and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description	methods of syster	m models,
•	c systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creat	•	•
	ear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to		
and digital controlle	s of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial	implementation of	continuous
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	roduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques neede		_
	cision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by		
as a virtual assistar	nt 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
I	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement	1	1
active part in the la	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both tl	ne midterm and the	e final term
tests with the succe	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind	ividual teachers du	uring the fir
DI 440 04	class of the term.	7.714	
BI-AAG.21	Automata and Grammars uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	Z,ZK	5
	ars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the	-	-
	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
- 1	This is a selective course for preparing talented student for representation in international programming contests.	ı	1
BI-ACM2	Programming Practices 2	KZ	5
·	This is a selective course for preparing talented student for representation in international programming contests.		<u>.</u>
BI-ACM3	Programming Practices 3	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.	I	
BI-ACM4	Programming Practices 4	KZ	5
DI ADILO4	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 difference
	ne internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They idministrator 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 kn	•	•
•	specific examples from practice.	J	
BI-ADW.1	Windows Administration	Z,ZK	4
<u> </u>	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
	s the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cu		-
•	ledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the rithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asyr	-	oniplexity o
BI-AG2.21	Algorithms and Graphs 2	Z.ZK	5
	Angularities and Graphs 2  anted in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsor	,	_
delves into advanc	ces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Eng BIE-AG2.21.	lish version of the	course see
BI-ALO	Algebra and Logic	Z,ZK	4
<u> </u>	The course extends and deepens the study of topics touched upon in the basic course in logic.	1	
BI-AND.21	Programming for the Android Operating System  This course is presented in Czech.	KZ	4
BI-ANG	English Language, Internal Certificate  Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN	ZK IG	2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK	English language, contact preparation for the B2 level exam	7	2
	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement	. –	_
	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the		
active part in the is			
	es rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind class of the term.	ividual teachers de	aring the in
=		Z,ZK	4

BI-APS.21			
Chudonto will look	Architectures of Computer Systems	Z,ZK	5
	n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec		
	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principal processors, but also in guestoolies processors that are expenses of	-	-
<u>-</u>	processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coher		
programm mo ocum	systems.		,
BI-ARD	Interactive applications on Arduino	KZ	4
	pned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple application	ons for modern pro	grammable
kits and control va	ried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded sy	ystems, i.e. to see t	he results
not only on displa	ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	s suitable even for	Web and
DI 40D 04	Software Engineering students.	771	
BI-ASB.21	Applied Network Security use is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gainer	Z,ZK	5
	ons like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing		
Security applicat	knowledge of security applications in computer networks.	j ine course stader	it will got
BI-AVI.21	Algorithms visually	Z,ZK	4
	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer sc		ubstantially
knowledge presente	ed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org≪	t;http://www.algovis	ion.org>)
	that make understanding the principles of algorithms easy.		
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
	equainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and because the process of the process		
	ice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam		
BI-BAP.21 BI-BEK.21	Bachelor Thesis Secure Code	Z,ZK	14 5
	Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa		-
	gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		•
-	ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing		
security and	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	e defense against t	them.
BI-BIG.21	DB Technologies for Big Data	KZ	5
	roduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is for		
_	e students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible me	-	
conection, transion	nation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical of individual technologies will be supplemented with specific examples from practice.	ai iouridation and p	resentation
BI-BLE	Blender	Z,ZK	4
	ds knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those in		
	offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph		
BI-BPR.21	Bachelor project	Z	1
_	g of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the p		
١.	semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at the		
· ·	enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut		-
	l signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the top mulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assig		
	can be supplemented and approved at the end of the semester.	,	
BI-CCN	Compiler Construction	Z,ZK	5
This is an introd	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for stu	idents to
	nd the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class	i.
BI-CS1	Programming in C#		
		KZ	4
The goal of the co	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co	onstruction, types o	f variables,
The goal of the co- operators, arrays	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cos, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defi	onstruction, types of inition and class ins	f variables, stancing,
The goal of the co- operators, arrays	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co	onstruction, types of inition and class ins	f variables, stancing,
The goal of the co- operators, arrays	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cos, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging well as work with files are emphasized.	onstruction, types of inition and class instant and exception proc	f variables, stancing,
The goal of the co- operators, arrays constructors, methal	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cos, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defiords, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging	onstruction, types of inition and class instant exception proc	f variables, stancing, cessing, as
The goal of the co- operators, arrays constructors, methan BI-CS2 The C# language get to know object	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cos, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging well as work with files are emphasized.  C# language and data access  and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micros s used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technical data access.	onstruction, types of inition and class instand exception process of platform. The strologies such as LI	f variables, stancing, cessing, as  4  udents will  NQ - a set
The goal of the co- operators, arrays constructors, methal BI-CS2 The C# language get to know object of features for que	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cos, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class deficed ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging well as work with files are emphasized.  C# language and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micros is used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (L	onstruction, types of inition and class instand exception process. KZ oft platform. The strologies such as LI.INQ to Objects, LIN	f variables, stancing, cessing, as  4  udents will  NQ - a set  NQ to XML
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BI-EHA.21	Ethical Hacking	Z,ZK	5
	course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln		
exploitation in cor	mputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is	on hands-on expe	rience with
51.51.5	vulnerabilities testing and the following process of penetration test documentation.	7 716	
BI-EHD	Introduction to European Economic History	Z,ZK	3
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-EJA	Enterprise Java	Z,ZK	4
The course is on a	advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sys	stems which are co	onnected to
DI E II	a database and are accessed through the web interface.	7.71/	
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
The course is on a	dvanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise informat architecture, that can be deployed to the cloud.	lon systems with r	nicroservice
BI-EP1.24		KZ	4
DI-EF1.24	Effective programming 1 The course is taught in Czech.	KZ	4
BI-EP2	Efficient Programming 2	KZ	4
	fficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indivi-	I	
Continuation of E	with the aim to choose the best one and avoid implementation errors.	addi problems dre	alocasoca,
BI-EPP.21	Economic Business Processes	Z,ZK	5
	urse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and		
	fronment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the	•	
	he company, through the management of property and capital structure, financing of the company, determining the cost function of the		
	evaluating the financial health of the company and its eventual rehabilitation or termination.		·
BI-FBI.21	Financial Business Intelligence	Z,ZK	5
	irse is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business		ing its value
and other indicator	rs for comparison with other companies and management decision process at the tactical and strategic level. The second view is mar	nagement accounti	ng as a tool
for financial manag	gement and prediction of business development. Management accounting allows monitoring of the financial status and performance of l	business activities	over several
accounting perio	ods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and	d to use value info	rmation to
assess options re	elated to future business decisions. The principles of management accounting, described in this course, are the basis of Business Inte	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 contains a gener	ral overview
	of fundamental microeconomic and macroeconomic topics.		
BI-FMU	Financial and Management Accounting	Z,ZK	5
	urse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the pa	_	
	ounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modificatio rations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manage		
or economic ope	Business Inteligence moduls in Business information systems.	ment accounting a	ire base or
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 pract		
	implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s		
BI-GIT.21	SW Development Technologies	Z	3
	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to	I	_
	from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use		
BI-HAM	HW accelerated network traffic monitoring	KZ	4
	iduces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. Th	1	1 1
	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a s	•	
for analysis). The g	goals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traff	ic on a hardware a	ind software
	level and to develop their practical abilities in this field.		
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
This course is for	students interested not only in technical scope of computer science, but also in making products usable - for users and for developer	s. Students of this	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	with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operation	ating principles of c	ryptographic
-	eatures of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW res	_	
attacks and tampe	ering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including a	pplications and rel	ated topics
DI 15.5 - :	for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.		
BI-IDO.21	Introduction to DevOps	Z,ZK	5
	with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of syst		
	o support software development, testing and compilation. It also focuses on tools for automating infrastructure management and build		
une cioud. It is ar	n introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquaint used in practice.	eu wiiii iiiodeiii te(	ciliologies
BI-IOS	'	KZ	4
DI-103	Fundamentals of iOS Application Development for iPhone and iPad  This course is presented in Czech.	1	4
DI IOT 04		7 71/	
BI-IOT.21	Internet of Things s on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an over	Z,ZK	5
	ication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architec		
	computer labs, students will gain practical experience with developing simple IoT systems using common development environments		
	software - Arduino, Raspberry Pi OS).		- ,,
	· · · · · · · · · · · · · · · · · · ·		

BI-JPO.21 Computer Units Z,ZK 5 Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KAB.21 Cryptography and Security Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to use cryptographic keys and certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in applications. Within labs, students will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of cryptanalysis. BI-KOM.21 Conceptual Modelling The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. **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 advanced language constructions. The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a modern, object-functional way with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages) BI-KSA Cultural and Social Anthropology ZK The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, health, history, death, etc ...) will be shown. The course is presented in Czech. Linear Algebra 1 BI-LA1.21 Z,ZK 5 We will introduce students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of real and complex numbers and also over finite fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimination method (GEM) and show the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenvalues and eigenvectors of a matrix. We will also demonstrate some applications of these concepts in computer science. BI-LA2.21 Linear Algebra 2 Z,ZK Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech. BI-LOG.21 Mathematical Logic The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained BI-MA1.21 Mathematical Analysis 1 Z,ZK We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms. BI-MA2.21 Mathematical Analysis 2 Z,ZK The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learn how to integrate by parts and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the computation of elementary functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and its analysis using the Master theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and Hessian matrix, we study the analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of multivariate functions. BI-MDF.21 Modern Data Formats ΚZ The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type and the data formats used for that data type along with tools available to work with such data. After finishing the course, the students should know how to work with common data, e.g. on the Web Multimedia and Graphics Applications Z,ZK Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for working with images, videos, 3D graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphic formats, and compression technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the principle of operation and use of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models. **BI-MIT** Mikrotik technologies The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are commonly used by the small and middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the metallic, optical or wireless links and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer networks concepts like protocols and technologies of the data-link, network and transport layer of the OSI model. BI-ML1.21 Machine Learning 1 Z,ZK The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional data visualization. In practical demonstrations, pandas and scikit libraries in Python will be used.

BI-ML2.21	Machine Learning 2	Z.ZK	5
	ourse is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in par	,	-
	rks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction method		
	basic principles of reinforcement learning and natural language processing.		
BI-MMP	Multimedia team project	KZ	4
	This course is presented in Czech.		<u> </u>
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
e course is focus	sed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa	serial bus (USB)	. The cour
cludes both PC s	side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB	devices, Linux a	nd Windov
	drivers, simple application development, and APIs of selected devices.		
BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5
-	ourse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augm	-	
gh resolution disp	plays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione	d technologies, n	amely frac
DI CODO4	and procedural visualization, scientific data visualization, and 3D model scanning.	7.71/	
BI-OOP.21	Object-Oriented Programming	Z,ZK	5
	programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together		-
urse students ge	et acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphoror developing software, which includes testing, error handing, refactoring, and application of design pattern.	asis is on practica	ii teciiiiqu
BI-OPT	Introduction to Optical Networks	Z.ZK	4
_	introduction to Optical Networks  overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possi	,	1
_	k technology and on their solutions. The course will include the history of optical communications, an overview of passive components	-	
•	nsators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system	• •	•
	e topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as	,	
-	ency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters.		
·	from practice.		
BI-ORL	Operations Research and Linear Programming	KZ	5
_	to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundam		1
Operatio	onal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such	n as managemen	t).
BI-OSY.21	Operating Systems	Z,ZK	5
	s a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp	lementations, rac	e conditio
tical regions, thre	ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monit	oring. They are al	ble to des
	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Wi	ndows.	
BI-PA1.21	Programming and Algorithmics 1	Z,ZK	7
tudents gain the	'		
	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, struc	tured, pointers), e	expression
-	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, struc ions, concept of recursion.They learn to analyse simple cases of algorithm complexity.They know fundamental algorithms for searchir		-
_			-
-	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching		-
tatements, functi	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching with linked lists and trees.	ng, sorting, and m	nanipulatir
BI-PA2.21 udents know the	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchin with linked lists and trees.  Programming and Algorithmics 2	Z,ZK ue, enlargeable a	7
BI-PA2.21 udents know the	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchin with linked lists and trees.  Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	Z,ZK ue, enlargeable a	7 rray, list, s
BI-PA2.21 udents know the	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchin with linked lists and trees.  Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que in these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e	Z,ZK ue, enlargeable a	7
BI-PA2.21 udents know the table). They lear BI-PAI.21 The aim of the co	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching with linked lists and trees.  Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que in these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (expoying/moving of objects, operator overloading, inheritance, polymorphism).  Law and Informatics  purse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of	Z,ZK ue, enlargeable a .g., template prog	7 rray, list, s gramming, 5 n the Czec
BI-PA2.21 udents know the table). They lear BI-PAI.21 The aim of the co Republic and w	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching with linked lists and trees.  Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que in these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (expoying/moving of objects, operator overloading, inheritance, polymorphism).  Law and Informatics  Durse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of 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 co	Z,ZK  ue, enlargeable a .g., template prog  ZK  doing business ir ntracts in real and	7 rray, list, s gramming, 5 n the Czec d Internet
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BI-PKM	Introduction to mathematics	Z	4
BI-PMA	This course is presented in Czech.  Programming in Mathematica	Z,ZK	4
	rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programm		1 -
	etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.		
BI-PNO.21	Practical Digital Design	KZ	5
	rerview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the on technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in		
and implementation	tools.	dustry-staridard (	JAD design
BI-PPA.21	Programming Paradigms	Z,ZK	5
	with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par		
	ligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. Th s and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstr		
on lambda calcula	such as C++ and Java.	cam programming	g languages
BI-PRR.21	Project management	Z,ZK	5
	urse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, anal		•
• •	cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as ource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st		-
	nowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar		
	also suitable for all those who will develop software or hardware in the form of team projects.		
BI-PRS.21	Practical Statistics	KZ	5
	e introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose mod gression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softwar	_	
wiii ericompass re	methods on data from real problems.	e it and will apply	tile studied
BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a ge	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi	on, they gain a de	eeper insight
DI DOLOA	into shell and some other particular scripting languages and will get practical experience with shell script programming.	7.71	
BI-PSI.21	Computer Networks ces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local r	Z,ZK	5
	s will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw		
	actically verify configurations and management of network devices in the lab within the environment of the operating systems Linux a	=	
BI-PST.21	Probability and Statistics	Z,ZK	5
	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T	=	
	om variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction nown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical	-	-
odimations of anic		nypourous and	dotorrilling
	the statistical dependence of two or more random variables.		
BI-PYT.21	Python Programming	KZ	5
The aim of the co	Python Programming urse is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data	processing. The	differences
The aim of the colored	Python Programming urse is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data by of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format	processing. The of a Jupyter note	differences book, which
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The aim of the cobetween philosophenables greater activated by the property of	Python Programming urse is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data by of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format coent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester the semester.  Quantum algorithms and programming ng students hands-on experience with quantum computers and their programming. We tocus on fundaments of quantum mechanics, o orithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developr ge. Knowledge of linear algebra at the level of Bi-LA1 and Bi-LA2 (or Bi-LIN) is necessary. Previous completion of Bi-MA2 or Bi-VMM might be an advantage. No previous knowledge of physics is assumed.  Quality Assurance duces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of all experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found computer of the structure and Architecture acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arrithmic nucleation, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proces in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.  Computer Engineering Seminar I mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to dividually within the subject. Each student or group of students solves some interesting topic with the	a processing. The of a Jupyter note work will be assigned by the product under the p	differences abook, which gned during  5 technologies hich is based with Python  4 of software erform a test nder test.  5 controllers, implemented  4 cks. Students with scientific new for each  4 cks. Students with scientific new for each  4 cks. Students with scientific new for each  5 sockets. The

introduces basic	modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in corprogramming language environment.	mputer labs using a	a chosen
BI-SKJ.21	Scripting Languages	Z,ZK	4
	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi- into shell and some other particular scripting languages and will get practical experience with shell script programming.	<i>'</i>	
BI-SOJ	Machine Oriented Languages	Z,ZK	4
l l	rse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us		-
and efficient cooper	ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view lir	ked to higher level	languages.
	This knowledge will be used during reverse engineering, optimization, and evaluation of code security.		
BI-SP1.21	Team Software Project 1	KZ	5
Students gain ha	ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	e BIE-SWI course t	hat runs
concurrently and th	nat teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teach	er, in the role of the	e team and
project leader, regu	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.	efact will be further	developed
BI-SP2.21	Team Software Project 2	KZ	5
	s-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result	of the BIE-SP1 cou	
However, in this fo	ollow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work	in teams of 4-6 pe	ople. The
teache	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	of their solution.	·
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		-
	. 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.		
BI-SQL.1	Language SQL, advanced	KZ	4
· ·	knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa		
	jueries, 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 ar	•	
	d. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle	•	· · ·
	PostgreSQL.	•	,
BI-SRC.21	Real-time systems	Z,ZK	5
	ne basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues		-
	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are		٠ ا
·	course.		
BI-ST1	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
DI-012	This course is presented in Czech.	_	3
BI-ST3	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		
get furtifier exterio	simple topology, security, etc.	ctability, exterior	boyona a
BI-ST4	Network Technology 4	Z	3
	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	l,	
	of further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici	-	
ŭ	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely		
	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch		
· · · · · · · · · · · · · · · · · · ·	nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation	· ·	
	network running.	ayooa	tanınığ tile
BI-STO	Storage and Filesystems	Z,ZK	4
	rn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi		
THO OLUGORI WIII IOU	load balancing and high availability.	viing, ao oo ao otore	igo ocaiii ig,
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
	are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in		
•	to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use	•	
inii oddooo olddonio	problems of practice that the graduates may encounter.	or camora cyclomic	, lor corving
BI-SWI.21	Software Engineering	Z,ZK	5
	software Engineering inted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They co		
	ring the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-c	-	
_	nguage UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design a	· · · · ·	
_	idents also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their	-	, ,
BI-TAB.21	Applications of Security in Technology	Z,ZK	5
	urse is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stude	<i>'</i>	
The goal of the co.	cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware	=	VOI VIOW OI
BI-TDA	Test driven architecture	KZ	4
	rest driverr architecture: sused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that ar	l.	
	urse has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occu		
BI-TDP.21	Documentation and Presentation	KZ	3
	ed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fi	I.	
	of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese		
	to a technical report in the Latex system, process an electronic presentation using the Latex beamer system, and practically presecutive is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14		
	exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.	v	
	Spread to the country of the country		

**BI-TEX** TeX and Typography Z,ZK 4 This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course focuses on typographic rules. Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. Java Technology The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z.ZK The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TUR.21 User Interface Design 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 software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BI-TWA.21 Design of Web Applications The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV\* framework React. BI-TZP.21 Technological Fundamentals of Computers Z,ZK 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 7.7K 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 Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). BI-UOS.21 Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell 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. 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 Z,ZK 5 Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. 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. **Data Visualization** The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language. Selected Mathematical Methods **BI-VMM** The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and their properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples. 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. Virtual reality I Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared social activities. BI-VR2 Virtual reality II Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The objective is to develop applications for computer science and gamification in various social metaverse and desktop engines. BI-VWM.21 Searching the Web and Multimedia Databases Z,ZK Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). **BI-ZIVS** Intelligent Embedded System Fundamentals ΚZ Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. PHP Framework Nette - basics **BI-ZNF** Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. BI-ZPI Process engineering ΚZ Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. Z,ZK BI-ZRS.21 Basics of System Control The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. Bachelor internship abroad for 10 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Bachelor internship abroad for 20 credits 20 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS30 Bachelor internship abroad for 30 credits 30 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.

BI-ZSB.21	Basics of System Security	Z,ZK	5
•	urse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensi	•	•
such as malware a	nalysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder	n operating syste	ms security,
DI 71114 C.	as well as skills needed for independent work in the area of operating system security incident analysis.	<b></b>	T -
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	oduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed		
	ecision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be irtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art du		ennity, SUCII
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
DI-2000	This course is presented in Czech.	2,21	-
BIE-CSI	Introduction to Computer Science	Z	2
	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie	_	
	ol students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go		
and relate basic p	inciples of computer science for students to understand, early on, what computer science is, why things such as high-level programmer.	ning languages a	nd tools are
	are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no		
questions but also	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interes	ted in computer s	science more
DIE DIE	than expected, or even less than before.	7 71/	
BIE-DIF	Differential equations	Z,ZK	5
	s a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential so neorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered wit		
•	sis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world application		
	equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs		
	and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-EEC	English language external certificate	Z	4
he BIE-ECC cours	e can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English	sh comparable to	or exceeding
	the B2 level of the Common European Framework of Reference for Languages.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh ar	d extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	ble to apply them	in particular
DIE 0= -	examples.		T -
BIE-SEG	Systems Engineering  Note that the class is to introduce having principles of	Z	0
	ory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of c		
•	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking t difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor		
aaorotana trie i	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z.ZK	4
_	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical	,	areas of state
pace search, multi	-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm	s and the neural r	networks, will
	be presented as well.		
FI-TOP	Academic writing	Z	2
-	portant and required part of research activity. It is not only about obtaining research results but also about applying them in the form of	-	-
	suseful 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		
	cle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an appropriate will be taught in blocks, with an electure at the beginning of the competer and one practicum in the middle of the competer.		
eise's article. The t	course will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Date on the availability of enrolled students.	ites will be determ	ililieu baseu
FIT-ITI	Modern IT infrastructure	Z,ZK	5
FIT-SEP	World Economy and Business	Z,ZK	4
	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by co		1 -
· · · · · · · · · · · · · · · · · · ·	vorld economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as		
, ,	nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of di		
	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
FITE-EHD	Introduction to European Economic History	Z,ZK	3
The course introdu	ces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco	nomy through the	description
	in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	, ,	
	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution of the Middle Ages, from destruction of the Middle Ages, from destruction of the Middle Ages, from destruction of the Middle Ages, from the Middle Ages, fro		
uoes not cover de	tailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	rganizations in hi	story. Class
VII V CD	meetings will consist of a mixture of lecture and discussion.	V7	
NI-AFP	Applied Functional Programming ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming paradigms.	KZ	5
	and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master		ū
	necessary competence of a software engineer: the theory and especially the practice.		2005inos a
NI-DDM	Distributed Data Mining	KZ	4
	state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of		
	mework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a	=	_
	approaches to parallelize other algorithms. The course is prezented in czech language.		
NI-DSP	Database Systems in Practes	Z,ZK	4
<u>'</u>	This course is presented in Czech.		
NI-DZO	Digital Image Processing	Z,ZK	4
	nts a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg		·=
•	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also		
	rocessing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR	-	_
	abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conv		
interactive as-fl(	pid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac	ung deptri, alpha	a maung.

NI-IAM	Internet and Multimedia	Z,ZK	4	
	e is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq			
presentation of AV signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical use case scenarios of real-time				
	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 th	=		
the quality and late	for audience.	s scene up to the p	resentation	
NI-LSM	Statistical Modelling Lab	KZ	5	
_	ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p	ı	_	
•	on and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		I	
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesi	3).		
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	•		
	plex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development no			
	ing object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of			
•	ms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem			
NI-MPL	Managerial Psychology	ZK	2	
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4	
Mathematical se	emantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	model of lambda	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	•	<b>I</b>	
	ability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developmer urse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica		ents. The	
NI-PDD	Data Preprocessing	Z.ZK	5	
	repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s	, ,		
· · · · · · · · · · · · · · · · · · ·	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characterist		- 1	
	pages.			
NI-PSD	Public Services Design	KZ	4	
	oduce students to specifics of UX, Service design and development for public sector. We will look into the design and development pr	•	-	
suppliers (devs a	nd designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration Course is aimed at students-designers as well as clients.	with client represe	entatives.	
NI-PSL	Programming in Scala	Z.ZK	4	
_	ا uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature	,	-	
	brary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and		-	
	Scalaz, etc.			
NI-REV	Reverse Engineering	Z,ZK	5	
•	equainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated			
	ten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de-	•		
	bugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer			
	the course is on the seminars, where students will solve practically oriented tasks from the real world.			
NI-SYP	Parsing and Compilers	Z,ZK	5	
The module builds u	upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	rious variants and	applications	
NII TOD	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.	7 71/	-	
NI-TSP	Testing and Reliability  knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pres	Z,ZK	5 the help of	
•	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with but			
·	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		,	
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5	
Students will gai	n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	organizations. The	ey will get	
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiently operate and optimize the				
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effective technology today for the management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in the use of modern integration				
management of cor	and development tools (Continuous integration and development).	the use of modern	rintegration	
NI-VYC	Computability	Z,ZK	4	
- 1	Classical theory of recursive functions and effective computability.	, -		
TV1	Physical Education	Z	0	
TV2	Physical Education	Z	0	
TV2K1	Physical Education 2	Z	1	
TVK1	Physical Education	Z	1	
TVKLV	Physical Education Course	Z	0	
TVKZV	Physical Education Course	Z	0	
T\/\/	Physical aducation	7	^	

For updated information see <a href="http://bilakniha.cvut.cz/en/FF.html">http://bilakniha.cvut.cz/en/FF.html</a> Generated: day 2025-07-03, time 22:37.

Physical education