Study plan

Name of study plan: Bachelor Specialization Web Engineering, in Czech, 2021

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

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

Required credits: 156
Elective courses credits: 24
Sum of credits in the plan: 180

Note on the plan: Tato verze studijního plánu je ur ena pro ro níky, které byly p ijaty ke studiu od akademického roku 2021/2022 do prezen ní formy studia bakalá ského programu. . Garant: Ing. Lukáš

Ba inka, email: lukas.barinka@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

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

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

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

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

BI-AAG.21 Automata and Grammars

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

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

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

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

BI-DBS.21 Database Systems Z,ZK 5

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

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

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

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

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

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

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

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

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

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: 43

The role of the block: PS

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

Name of the group: Compulsory courses of specialization Web Engineering, version 2021

Requirement credits in the group: In this group you have to gain 43 credits

Requirement courses in the group: In this group you have to complete 9 courses

Credits in the group: 43 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-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-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	PS
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	PS
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	PS
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	PS
BI-TUR.21	User Interface Design Jan Schmidt Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	PS
BI-TWA.21	Design of Web Applications David Bernhauer David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	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-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal Ji í Novák Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	L	PS

Characteristics of the courses of this group of Study Plan: Code=BI-PS-WI.21 Name=Compulsory courses of specialization Web Engineering, version 2021

BI-AWD.21	Web and Database Server Administration	Z,ZK	5					
Students will get a	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 syste	ms. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of	a web server.						
BI-BIG.21	DB Technologies for Big Data	KZ	5					

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

BI-MDF.21 Modern Data Formats KZ 3

The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type and the data formats used for that data type along with tools available to work with such data. After finishing the course, the students should know how to work with common data, e.g. on the Web.

BI-PJS.21 JavaScript Programming KZ 5
The course is an introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code development in Javascript easier.

BI-SWI.21 Software Engineering Z,ZK

Students get acquainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They consolidate and practically verify their knowledge during the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-on experience with CASE tools using the visual language UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design and testing. Within the course, students also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their development.

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 Z,ZK 5

The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React.

BI-IDO.21 Introduction to DevOps Z,ZK 5

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-VWM.21 | Searching the Web and Multimedia Databases | Z,ZK | 5

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).

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-WI.21

Name of the group: Compulsory elective courses for the specialization Web engineering, version 2021

Requirement credits in the group: In this group you have to gain at least 5 credits (at most 10)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 2)

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-PHP.21	Programing in PHP Andrii Plyskach, Martin Urbanec, Otto Šleger Martin Urbanec Monika Borkovcová (Gar.)	KZ	5	3C	Z	PV
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	PV

Characteristics of the courses of this group of Study Plan: Code=BI-PV-WI.21 Name=Compulsory elective courses for the specialization Web engineering, version 2021

				
BI-PHP.21	Programing in PHP	KZ	5	
The course is an introduction to the PHP language and technology. Students will learn also best practices and will use tools that make development in PHP easier.				
The course is an introduction to the PHP language and technology. Students will learn also best practices and will use tools that make development in PHP easier. BI-PYT.21 Python Programming KZ			5	
The aim of the course is	s to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data	ata processing. Th	ne differences	

The aim of the course is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data processing. The differences between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format of a Jupyter notebook, which enables greater accent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester work will be assigned during the semester.

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> 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.

The BIE-ECC course can be recognized for any active semester after the submission of a external certificate at the level of at least B2 according to the Common European Framework of Reference.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ANG1	English Language Examination without Preparatory Courses Kate ina Valentová Kate ina Valentová (Gar.)	Z,ZK	2	2D	L	PJ
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PJ
BI-ANG	English Language, Internal Certificate Kate ina Valentová Kate ina Valentová (Gar.)	ZK	2	2D	Z,L	PJ

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

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2				
BIE-EEC	Z	4					
The BIE-ECC course ca	The BIE-ECC course can be recognized for any active semester after the submission of a certificate 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: Povinná t lesná výchova, sportovní kurzy

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.21

Name of the group: Compulsory Physical Education, version 2021

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 7) Credits in the group: 0

Note on the group:

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

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

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

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

Name of the block: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BI-V.2021

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

2024/25

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

Credits in the group: 0 Note on the group:

Note on the g						
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	٧
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V
BI-BLE	Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes Tomáš Vichta Tomáš Vichta (Gar.)	Z,ZK	4	2P+1C	L	V
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
NI-PSD	Public Services Design David Pešek, Ond ej Brém David Pešek Ond ej Brém (Gar.)	KZ	4	1P+2C		V

BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ei Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	٧
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	٧
BI-FMU	Financial and Management Accounting David Buchtela	Z,ZK	5	2P+2C	Z	٧
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	٧
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	٧
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
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BI-CS2	C# language and data access Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	0P+3C	Z	٧
BI-CS3	Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	3C	Z	٧
BI-SQL.1	Language SQL, advanced Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	٧
BI-QAP	Quantum algorithms and programming Tomáš Kalvoda, Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	٧
NI-LSM	Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.)	KZ	5	3C	L	V
BI-HAS	Human Aspects in Cryptography and Security Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPL	Managerial Psychology Jan Fiala Jan Fiala (Gar.)	ZK	2	2P	Z,L	V
NI-MSI	Mathematical Structures in Computer Science Jan Starý	Z,ZK	4	2P+1C	L	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MIT	Mikrotik technologies Jan Fesl Jan Fesl (Gar.)	KZ	3	1P+2C	Z	V
NI-MOP	Modern Object-Oriented Programming in Pharo Jan Blizni enko Robert Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Operations Research and Linear Programming Dušan Knop Dušan Knop Dušan Knop (Gar.)	KZ	5	1P+2C	L	٧
NI-OLI	Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ACM	Programming Practices 1 Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
BI-ACM2	Programming Practices 2 Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	Z	V
BI-ACM3	Programming Practices 3 Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
BI-ACM4	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-AND.21	Programming for the Android Operating System Jan Mottl, Jan Vep ek, Marek Kodr, 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	V
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
BI-KOT	Programing in Kotlin Jií Dan ek Jií Dan ek Jií Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-PKM	Introduction to mathematics Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z	4		Z	V
NI-REV	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I	Z	4	2C	L,Z	V
BI-SCE2	Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) Computer Engineering Seminar II	Z	4	2C	,	-
	Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)				L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Network Technology 4 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	L	V
BI-SKJ.21	Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2+2	L	V
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan 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	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
BI-TS1	Theoretical Seminar I Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture Marek Hakala	KZ	4	2P+1C	Z,L	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	KZ	4	3C	Z	V
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V

BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká , Petr Zemánek, Jan Ž árek Zden k Muziká Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	V
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán Petr Klán Petr Klán (Gar.)	KZ	3	1P+2C	L	V
BI-VAK.21	Selected Applications of Combinatorics Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ZS10	Bachelor internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
BI-ZS20	Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
BI-ZS30	Bachelor internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

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

TVK1	Physical Education	Z	1
TVV	Physical education	Z	0
TV1	Physical Education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
BI-ADW.1	Windows Administration	Z,ZK	4
This course is presente	d 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 and	d 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>) 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 Achievement - students are due to: -Take an active part in the language instruction. -Meet the requirements for writing assignments - Summary, Abstract, Argumentation Paper. -Succeed in both the midterm and the final term tests with the success rate set at 70%. -80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by individual teachers during the first class of the term.

BI-APJ	Aplication Programming in Java	Z,ZK	4
This course is presented	d in Czech. Advanced technologies in Java.		
NI-AFP	Applied Functional Programming	KZ	5
This secures is presente	d in Crack Functional programming represents and of the traditional programming paradiams. Traditional and naval function		

This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming languages are on the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mastering this paradigm becomes a necessary competence of a software engineer: the theory and especially the practice.

BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	d to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class		
be presented as well.	ent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorit	thms and the neur	al networks, will
BI-BLE	Blender	Z,ZK	4
	powledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those	· · · · · · · · · · · · · · · · · · ·	
	mplete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphic		· .
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is presente	d in Czech.	,	
BI-STO	Storage and Filesystems	Z,ZK	4
	rinciples and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	rchiving, as so as	storage scaling,
load balancing and high		1/7	
NI-PSD	Public Services Design	KZ	4
	ce students to specifics of UX, Service design and development for public sector. We will look into the design and developmer signesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration.	-	
	dents-designers as well as clients.	on war onone rope	scomativoc.
BIE-DIF	Differential equations	Z,ZK	5
	ioundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential		-
of variables. Key theore	ms on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered	with methods like	characteristic
	lowed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world application	-	
	tions (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODE	es and PDEs, incl	uding implicit
NI-DZO	ods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. Digital Image Processing	Z,ZK	4
-	comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical a		•
	interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is		
of digital image process	sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR	compression, de	-blurring in
•	traction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray c		
	ossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		
NI-DDM	Distributed Data Mining	KZ	4
	e-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hanc vork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation		- 1
·	ze other algorithms. The course is prezented in czech language.	s and will be capa	ible to propose
BI-EP1.24	Effective programming 1	KZ	4
The course is taught in			
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Efficien	t Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving ind	ividual problems a	re discussed,
with the aim to choose	the best one and avoid implementation errors.		
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
	se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
·	age instructionweet the requirements for writing assignments - 3ummary, Abstract, Argumentation Faper3ucceed in bornate 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.			aumig me met
BI-EJA	Enterprise Java	Z,ZK	4
	iced technologies in the Java programming language. The focus is on technologies for development of enterprise information		e connected to
a database and are acc	sessed through the web interface.		
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
	ced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise infor	mation systems w	ith microservice
	e deployed to the cloud.	7 71/	
BI-FMU	Financial and Management Accounting s explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the	Z,ZK	5
	and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of the course provides students with the course provides and the course provides and the course provides and the course provides are considered as the course provides and the course provides are considered as the course provides and the course provides are considered as the course provides and the course provides are considered as the cour	-	
of economic operations	based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manag	ement accounting	are base of
Business Inteligence m	oduls in Business information systems.		
BI-HAM	HW accelerated network traffic monitoring	KZ	4
	students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. T	_	-
	datory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as		
	of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network t bir practical abilities in this field.	iailic on a naiuwa	re and software
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is presente		_,,	J I
BI-ARD	Interactive applications on Arduino	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 appl	ications for moder	n programmable
•	peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded	' -	
	PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	e is suitable even	for Web and
Software Engineering s		ファリ	1
NI-IAM The NI-IAM course is for	Internet and Multimedia possesses of any significant for network transmissions of audiovisual (AV) signals. The syllabus includes according to the syllabus	Z,ZK	nnals (input)
	als (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic	-	
	ns. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the		
	of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording	g the scene up to	the presentation
for audience.			

science, high-school str	Introduction to Commutar Colones		
science, high-school str	Introduction to Computer Science	Z	2
. •	lass on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in othe Idents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The		-
and rolate baole princip	les of computer science for students to understand, early on, what computer science is, why things such as high-level prograi	•	
done the way they are,	and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer	not just basic con	nputer science
	tions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inte	erested in comput	er science more
than expected, or even		7	
BIE-IMA2	Introduction to Mathematics 2 tend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they ar	Z re able to apply th	2 em in particular
examples.	tend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are	re able to apply ti	lem in particular
BI-CS2	C# language and data access	KZ	4
The C# language and c	ata access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Mici	rosoft platform. Th	e students will
•	d to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current ted	•	
	and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL		
•	ther objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data course introduces Code First, Database First, Model First approaches.The students will also get to know the Conceptual Mo		-
(XML description).	source minerators code i mor, parasace i mor, mocor i mor approaches i mo catacino min alco got to mich me comospitati mo	rae., etc.ageea	or and mapping
BI-CS3	Language C# - design of web applications	KZ	4
	oduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview	ew of the developr	nent possibilities
	Il learn to create WebAPI and to use it by client programs.		
BI-SQL.1	Language SQL, advanced	KZ	4
	wledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. Ir es, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the po	•	. •
	clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan		
	res will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Orac	•	
PostgreSQL.			-
BI-QAP	Quantum algorithms and programming	KZ	5
	tudents hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic	· ·	- 1
	ms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development of the local of RLAA and RLAA (or RLAA) is proceeding. Proving completion of RLAA and RLAA (or RLAA) is proceeding.	-	
	nowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VN No previous knowledge of physics is assumed.	viivi and experienc	e with Python
NI-LSM	Statistical Modelling Lab	KZ	5
	on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is		-
available information ar	d its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms,	and analyses of t	heir properties.
At this point, the subject	t is on the border of own research and may result in the topic of final work (diploma or bachelor thesis).		
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
	nts interested not only in technical scope of computer science, but also in making products usable - for users and for develop edge to design, plan and analyse their own projects in the context of human-centered security.	ers. Students of t	nis course can
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
-	s of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scot	'	- 1
Introduction to category			
	Methods of interfacing peripheral devices		
	i vietnous of interfacing peripheral devices	Z,ZK	5
BI-MPP.21	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the control of the c		-
BI-MPP.21 The course is focused of includes both PC side a	on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of U	ersal serial bus (U	SB). The course
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application	in methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of London development, and APIs of selected devices.	ersal serial bus (U JSB devices, Linu	SB). The course x and Windows
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies	ersal serial bus (U JSB devices, Linu KZ	SB). The course x and Windows
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT The main motivation of	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of University of the devices of the devices of the content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are content of the subject stands in the subject s	ersal serial bus (U JSB devices, Linu KZ commonly used by	SB). The course x and Windows 3 y the small and
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT The main motivation of middle internet service	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies	ersal serial bus (U JSB devices, Linu KZ commonly used by e metallic, optical	SB). The course x and Windows 3 y the small and or wireless links
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT The main motivation of middle internet service and how to administrate	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of Properties of the peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of University of the properties of the peripheral devices of the properties of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the	ersal serial bus (U JSB devices, Linu KZ commonly used by e metallic, optical	SB). The course x and Windows 3 y the small and or wireless links
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT The main motivation of middle internet service and how to administrate and technologies of the NI-MOP	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of User development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo	ersal serial bus (U JSB devices, Linu KZ commonly used be e metallic, optical er networks conce	SB). The course x and Windows 3 y the small and or wireless links obts like protocols
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application BI-MIT The main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program	in methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of User development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated by the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated on the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated on the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated on the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated on the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated on the subject stands in the introduction of the subject stands in the introductio	KZ commonly used by metallic, optical er networks conce	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of User development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo Inning is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the significant course.	KZ commonly used by metallic, optical er networks concernity to naskills of design and	SB). The course x and Windows 3 y the small and or wireless links obs like protocols 4 tural abstraction implementation
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in motivation and technologies of the NI-MOP	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development	KZ commonly used by a metallic, optical er networks concernities ability to naskills of design and theeds and areas	SB). The course x and Windows 3 y the small and or wireless links ots like protocols 4 tural abstraction implementation of interest. In
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modaddition to deepening of the course of the co	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of User development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operated for the students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo Inning is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the significant course.	KZ commonly used by a metallic, optical er networks concert KZ ere its ability to na skills of design and the needs and areasurk on interesting p	SB). The course x and Windows 3 y the small and or wireless links ots like protocols 4 tural abstraction implementation of interest. In projects and OO
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modaddition to deepening of the course of the co	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo In ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work and transport layer of programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work and transport layer of programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work and transport layer of programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work and transport layer of programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work and transport layer of the opportunity to work and transport layer of the opportunity to work and transport layer of the opportunity to work and tr	KZ commonly used by a metallic, optical er networks concert KZ ere its ability to na skills of design and the needs and areasurk on interesting p	SB). The course x and Windows 3 y the small and or wireless links ots like protocols 4 tural abstraction implementation of interest. In projects and OO
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application by the main motivation of middle internet service and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modification to deepening of technologies in terms of BI-MVT.21 The goal of the course	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo In ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development biject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involve Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	ersal serial bus (U JSB devices, Linu KZ commonly used by e metallic, optical er networks conce KZ ere its ability to na skills of design and t needs and areas irk on interesting prement in the Pha Z,ZK igmented reality, v	SB). The course x and Windows 3 y the small and or wireless links obs like protocols 4 tural abstraction dimplementation of interest. In projects and OO to Consortium. 5 isualization on
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application by the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modification to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies Mikrotik technologies	ersal serial bus (U JSB devices, Linu KZ commonly used by e metallic, optical er networks conce KZ ere its ability to na skills of design and t needs and areas irk on interesting prement in the Pha Z,ZK igmented reality, v	SB). The course x and Windows 3 y the small and or wireless links obs like protocols 4 tural abstraction dimplementation of interest. In projects and OO to Consortium. 5 isualization on
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modification to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualization.	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to subject stands in the introduction of the RouterOS operating system and some network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo In ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development biject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning.	KZ commonly used by metallic, optical er networks concernity to naskills of design and the needs and areasurk on interesting pyement in the Phata, Z,ZK igmented reality, vioned technologie	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction dimplementation of interest. In projects and OO to Consortium. 5 isualization on s, namely fractal
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in moderation to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualize BI-MMP	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to subject stands in the introduction of the RouterOS operating system and some network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo In ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development biject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies In the course of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning. Multimedia team project	ersal serial bus (U JSB devices, Linu KZ commonly used by e metallic, optical er networks conce KZ ere its ability to na skills of design and t needs and areas irk on interesting prement in the Pha Z,ZK igmented reality, v	SB). The course x and Windows 3 y the small and or wireless links obs like protocols 4 tural abstraction dimplementation of interest. In projects and OO to Consortium. 5 isualization on
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of the main motivation of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in model addition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo Inming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development between the programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning. Multimedia team project din Czech.	KZ commonly used by e metallic, optical er networks concernetworks concernetworks and areas when the property of the property	SB). The course x and Windows 3 y the small and or wireless links ots like protocols 4 tural abstraction of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in more addition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opposed to subject stands in the introduction of the RouterOS operating system and some network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo In ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sidern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development biject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies In the course of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning. Multimedia team project	KZ commonly used by e metallic, optical er networks concernetworks concernetworks and areas with on interesting prement in the Phaz,ZK agmented reality, vioned technologie	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in more addition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to intress of the course is presented.	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of Properties of Labs are practically oriented. Students gain experience with implementation of relevant parts of Lon development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are oproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo mining is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sedern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning. Multimedia team project d in Czech. Operations Research and Linear Programming	ersal serial bus (UJSB devices, Linu KZ commonly used by metallic, optical er networks concert is ability to naskills of design and the needs and areas rk on interesting pyement in the Phaz,ZK agmented reality, vioned technologie KZ KZ damental optimizations	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modidition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to introperational research policy.	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the properties of the course side. Labs are practically oriented. Students gain experience with implementation of relevant parts of Use on development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo mining is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the soften pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development biect programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo f semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentication, scientific data visualization, and 3D model scanning. Multimedia team project d in Czech. Operations Research and Linear Programming oduce students to the issues of operational research and primarily to the practical application of linear programming as a functional programming as a functional program	ersal serial bus (UJSB devices, Linu KZ commonly used by the metallic, optical or networks concernetworks concernetworks and areas or the meds are areas or the meds and areas	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction implementation of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4 5 ation technique.
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in more addition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to introperational research pinch procedural systems.	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the proper of the prop	ersal serial bus (UJSB devices, Linu KZ commonly used by er metallic, optical er networks concert in the Phate in the Pha	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction limplementation of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4 5 ation technique. 4 sors and FPGAs
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in more addition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to introperational research properational research proceedings systems and procedural visualizes.	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of University of University of Peripheral devices is devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operoviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo Inming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the search pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentication, scientific data visualization, and 3D model scanning. Multimedia team project In Czech. Operations Research and Linear Programming oduce students to the issues of operational research and primarily to the practical application of linear programming as a functional research and primarily focuses o	ersal serial bus (UJSB devices, Linu KZ commonly used by er metallic, optical er networks concert in the Phate in the Pha	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction limplementation of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4 5 ation technique. 4 sors and FPGAs
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modidition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to introperational research pinch	In methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of User on development, and APIs of selected devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operoviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo mining is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the set dern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentiation, scientific data visualization, and 3D model scanning. Multimedia team project d in Czech. Operations Research and Linear Programming oduce students to the issues of operational research and primarily to the practical application of linear programming as a funcimarily focuses on the use of engineering met	ersal serial bus (UJSB devices, Linu KZ commonly used by the metallic, optical of the received and areas of the received	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction implementation of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4 5 ation technique. 4 sors and FPGAs udents. The
BI-MPP.21 The course is focused of includes both PC side a drivers, simple application of middle internet service and how to administrate and technologies of the NI-MOP Object-oriented program is used to build complex of object systems in modidition to deepening of technologies in terms of BI-MVT.21 The goal of the course high resolution displays and procedural visualiz BI-MMP This course is presente BI-ORL The subject aims to introperational research pinch provides who will be not provides knowled BI-ACM	methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of University of University of Peripheral devices is devices. Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operoviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute data-link, network and transport layer of the OSI model. Modern Object-Oriented Programming in Pharo Inming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the search pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentication, scientific data visualization, and 3D model scanning. Multimedia team project In Czech. Operations Research and Linear Programming oduce students to the issues of operational research and primarily to the practical application of linear programming as a functional research and primarily focuses o	ersal serial bus (UJSB devices, Linu KZ commonly used by er metallic, optical er networks concert in the Phate in the Pha	SB). The course x and Windows 3 y the small and or wireless links obts like protocols 4 tural abstraction limplementation of interest. In projects and OO ro Consortium. 5 isualization on s, namely fractal 4 5 ation technique. 4 sors and FPGAs

BI-ACM2	Programming Practices 2	KZ	5
	urse for preparing talented student for representation in international programming contests.		
BI-ACM3	Programming Practices 3 urse for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM4	Programming Practices 4	KZ	5
-	Flogramming Flactices 4 urse for preparing talented student for representation in international programming contests.	NZ.	5
BI-AND.21	Programming for the Android Operating System	KZ	4
This course is presen		112	'
BI-CS1	Programming in C#	KZ	4
The goal of the cours	e is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta		pes of variables
	ps, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de		_
	s, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggi	ing and exceptior	n processing, a
well as work with files	- -		
BI-PJV	Programming in Java	Z,ZK	4
	ted in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	1/7	
BI-PJS.1	JavaScript Programming	KZ	4
-	se is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases developmen dents of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register fo	•	
of study.	denies of bit-wor-wi.zo10 branch of study and do not have required knowledge to register for bit-1 wh. 1. They should register to	or triis course iir ti	nen 4m semes
BI-KOT	Programing in Kotlin	Z,ZK	4
	ا atically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adv		1
	Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of		
	er-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
VI-PSL	Programming in Scala	Z,ZK	4
The course introduce	s the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feat	ures - e.g.patterr	matching and
advance standard libr	ary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks	and libraries e.g.	Play, Cassand
Scalaz, etc.			
BI-PMA	Programming in Mathematica	Z,ZK	4
	ing with modern technical and scientific software. Students will learn how to use different programming styles (functional progra	amming, rule-bas	ed programmin
•	ynamic interactive applications and visualisations, data processing and presentations.	1/7	
BI-PHP.1	Programing in PHP	KZ	4
_	in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register		
	e in their 3rd semester of study.	IOI BIE-TWA.T. I	riey sriouiu
egister for trils cours	e in their ord semester or study.		
RI_DC2	Programming in shell 2	7 7K	1
_	Programming in shell 2	Z,ZK	4 deeper insigh
Students gain a gene	Programming in shell 2 ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming.		
Students gain a gene into shell and some o	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additional theorems of the programming and the programming style in the programming and the programming is the programming and the programming is the programming in the programming is the programming is the programming is the programming in the programming is the programming in the programming is the pro	dition, they gain a	
Students gain a gene nto shell and some on NI-PDD	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add	dition, they gain a	deeper insigh
Students gain a gene into shell and some on NI-PDD Students learn to pre	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such	a deeper insigh
nto shell and some on NI-PDD Students learn to pre	oral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data	Z,ZK ta sources, such	5 as images, text
Students gain a gene noto shell and some on NI-PDD Students learn to prelitime series, etc., and pages.	oral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data	Z,ZK ta sources, such	a deeper insigh
Students gain a gene noto shell and some on NI-PDD Students learn to prestime series, etc., and	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics	dition, they gain a Z,ZK ta sources, such ristics from image	a deeper insight 5 as images, text
Students gain a gene nto shell and some on NI-PDD Students learn to prepare series, etc., and pages. BI-PKM	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics	dition, they gain a Z,ZK ta sources, such ristics from image	a deeper insigh 5 as images, textes or from web
Students gain a generation shell and some of NI-PDD Students learn to prepare to prepar	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z Z,ZK before and after t	5 as images, textes or from web
Students gain a generation shell and some of NI-PDD Students learn to prepare to prepare the series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students will	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics sted in Czech. Reverse Engineering Juainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens ill understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is deci	Z,ZK ta sources, such ristics from image Z Z,ZK before and after to dicated to reverse	a deeper insight 5 as images, tex es or from web 4 5 the main function engineering of
Students gain a generation shell and some of NI-PDD Students learn to presime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students witten in	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after to dicated to reverse edicated to debu	5 as images, tex es or from web 4 5 the main function engineering of the german of the
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students with applications written indebuggers and debug	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after to dicated to reverse edicated to debu	5 as images, tex es or from web 4 5 the main function engineering of the german of the
Students gain a gene nto shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students wi applications written in debuggers and debug he course is on the stand some of t	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z Z,ZK before and after to dicated to reverse edicated to debu er malware scen	a deeper insigh 5 as images, tex es or from web 4 5 the main function e engineering of ggers: how e. The focus of
Students gain a generation shell and some of NI-PDD Students learn to prepare series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquise called. Students wi applications written in debuggers and debug he course is on the series.	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after to dicated to reverse ledicated to debu er malware scen	a deeper insight 5 as images, texes or from web 4 5 the main function engineering of ggers: how e. The focus of
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students with applications written in debuggers and debug the course is on the start of Company of C	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z Z,ZK before and after to dicated to reverse edicated to debu er malware scen Z te to failures and	a deeper insight 5 as images, texes or from web 4 5 the main function of the engineering of the gers: how e. The focus of 4 attacks. Studer
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquise scalled. Students with applications written in debuggers and debug the course is on the stall-SCE1 The Seminar of Compare approached indivision of the stall series and the stall series approached indivision of the stall series approached ind	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor	5 as images, texes or from web 4 5 the main function engineering of ggers: how e. The focus of the with scientific with scientific the with scientific the with scientific the description of the scientific the scienti
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students wi applications written in debuggers and debug the course is on the state of the Seminar of Compare approached individed NI-PDD.	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor	a deeper insight 5 as images, tex es or from web 4 5 the main function engineering of agers: how e. The focus of 4 attacks. Studer rk with scientification in the student of the scientification of the scient
Students gain a generate shell and some of NI-PDD Students learn to prejume series, etc., and pages. BI-PKM This course is presentled. Students will get acques called. Students with applications written in the series and debug the course is on the series and other projects.	ther particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various datalearn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics Introduction to mathematics It is inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decided by the students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be decigned work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer seminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I protect is limited by the possibilities of the seminar tead fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead in the part of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the seminar tead in the subject is limited by the possibilities of the se	Z,ZK ta sources, such ristics from image Z,ZK before and after to dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor chers. The topics	5 as images, texes or from web 4 5 the main functive engineering orgers: how e. The focus of the with scientificate new for each
Students gain a generate shell and some of NI-PDD Students learn to prepare series, etc., and pages. BI-PKM This course is present of the series and debug is called. Students will get acque so called. Students with publications written in lebuggers and debug in course is on the series and other properties and other properties. BI-SCE1 BI-SCE2	ral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor chers. The topics	a deeper insight 5 as images, textes or from web 4 5 the main function of the engineering of the engineer
Students gain a generate shell and some of NI-PDD Students learn to prepare series, etc., and pages. BI-PKM This course is present values and students will get acquist called. Students with applications written in the buggers and debug the course is on the series and other properties and other properties. BI-SCE1 The Seminar of Compare approached indiverticles and other properties. BI-SCE2 The Seminar of Compare series and se	ther particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics Introduction to mathematics Interest Engineering Data Preprocessing Introduction to mathematics Introduction to m	Z,ZK ta sources, such ristics from image Z,ZK before and after of the control of	a deeper insight 5 as images, texes or from web 4 5 the main functive engineering orgers: how e. The focus of the attacks. Studentk with scientificare new for eattacks.
Students gain a generate shell and some of NI-PDD Students learn to prepare series, etc., and pages. BI-PKM This course is present vil-REV Students will get acquist called. Students with applications written in lebuggers and debug the course is on the series and other properties and other properties. BI-SCE1 The Seminar of Compare approached individuals and other properties. BI-SCE2 The Seminar of Compare approached individuals and other properties.	ther particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Data Preprocessing Data Preprocessing Data Preprocessing and analysis. They learn what algorithms can be used to extract information from various data learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character introduction to mathematics Introduction to mathematics Reverse Engineering Dainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens is understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decided to certain the course will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be done of the course will also be done of the course will also be done of the course will be dedicated to the latest trends on the computer seminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Dater Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach computer Engineering Seminar II Dater Engineering Seminar II Dater Engineering Seminar II Dater Engineering Seminar II	Z,ZK ta sources, such ristics from image Z,ZK before and after of the control of	5 as images, texes or from web 4 5 the main functive engineering of ggers: how e. The focus of the with scientificate new for each attacks. Studentk with scientificate k with scientificate with scientifi
Students gain a generate shell and some of NI-PDD Students learn to prepare series, etc., and pages. BI-PKM This course is present of Students will get acquist called. Students with applications written in lebuggers and debug the course is on the series and other properties and other properties. BI-SCE1 The Seminar of Compare approached individualities and other properties. BI-SCE2 The Seminar of Compare approached individualities and other properties.	ther particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Dare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character line in Czech. Introduction to mathematics Interest Engineering Jainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens in understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decided to c++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be digging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compute terminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Jouer Engineering Seminar I Jouer Engineering Seminar II Jouer Engineering Seminar	Z,ZK ta sources, such ristics from image Z,ZK before and after of the control of	a deeper insight 5 as images, textes or from web 4 5 the main functive engineering orgers: how e. The focus of the with scientificate new for each attacks. Studentk with scientificate new for each attacks. Studentk with scientificate new for each attacks. Studentk with scientificate new for each attacks.
Students gain a generate shell and some of NI-PDD Students learn to pregime series, etc., and bages. BI-PKM This course is present of NI-REV Students will get acquist called. Students witten in debuggers and debuggers and debuggers and debuggers and debuggers and other programmers. BI-SCE1 The Seminar of Compare approached individual called and other programmers. BI-SCE2 The Seminar of Compare approached individual called and other programmers. BI-SCE3 The Seminar of Compare approached individual called and other programmers. BI-SCE3 The Seminar of Compare approached individual called and other programmers. BI-ST1	ther particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the subjects - e.g., extraction of character individual projects - e.g., extr	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor chers. The topics Z to to failures and the subject is worth chers. The topics Z to to failures and the subject is worth chers. The topics	a deeper insight 5 as images, textes or from web 4 5 the main function of the engineering of the engineer
Students gain a generation shell and some of NI-PDD Students learn to prejime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students witten in debuggers and debuggers and debuggers and debuggers and debuggers and other programmers. BI-SCE1 The Seminar of Compare approached individual called and other programmers. BI-SCE2 The Seminar of Compare approached individual called and other programmers. BI-SCE3 The Seminar of Compare approached individual called and other programmers. BI-ST1 The subject is oriented.	The particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Dare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character introduction to mathematics Introduction to mathematics Interest in Czech. Reverse Engineering Juinted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens and obfuscation techniques. Another part of the course is decided to the semantial solution of the course will also be decided and the students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be decided and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer seminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Duter Engineering Seminar I Justic Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance ideally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N. laboratories. The capacity of the subject is limited by the possibilities of the seminar teach computer. Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance ideally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N. laboratories. The capacity of the subject is limited by the po	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor chers. The topics Z to to failures and the subject is worth chers. The topics Z to to failures and the subject is worth chers. The topics	a deeper insight 5 as images, textes or from web 4 5 the main function of the engineering of the engineeri
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist applications written in debuggers and debuggers and debuggers and debuggers and debuggers and debuggers and other properties and other properties. BI-SCE2 The Seminar of Compare approached individual articles and other properties. BI-SCE2 The Seminar of Compare approached individual articles and other properties. BI-ST1 The subject is oriented.	ther particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing pare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the subjects - e.g., extraction of character individual projects - e.g., extr	Z,ZK ta sources, such ristics from image Z,ZK ta sources, such ristics from image Z Z,ZK before and after to dicated to reverse edicated to debu er malware scen Z the to failures and the subject is worthers. The topics Z to to failures and the subject is worthers. The topics Z to to failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics	a deeper insight 5 as images, textes or from web 4 5 the main function of the engineering of the engineer
Students gain a generation shell and some of NI-PDD Students learn to prejime series, etc., and pages. BI-PKM This course is present NI-REV Students will get acquist called. Students witten in debuggers and debuggers and debuggers and debuggers and debuggers and other programmers of Compare approached individual called and other programmers. BI-SCE2 The Seminar of Compare approached individual called and other programmers. BI-SCE2 The Seminar of Compare approached individual called and other programmers. BI-ST1 The subject is oriented CCNA1 - R& CCNA1 - R& CONATOR COMPARENT CONATOR C	The particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Dare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character introduction to mathematics Introduction to mathematics Interest in Czech. Reverse Engineering Juinted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens and obfuscation techniques. Another part of the course is decided to the semantial solution of the course will also be decided and the students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be decided and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer seminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Duter Engineering Seminar I Justic Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance ideally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N. laboratories. The capacity of the subject is limited by the possibilities of the seminar teach computer. Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance ideally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N. laboratories. The capacity of the subject is limited by the po	Z,ZK ta sources, such ristics from image Z,ZK before and after of dicated to reverse edicated to debu er malware scen Z te to failures and the subject is wor chers. The topics Z to to failures and the subject is worth chers. The topics Z to to failures and the subject is worth chers. The topics	a deeper insign a deeper insig
Students gain a generate shell and some of NI-PDD Students learn to presime series, etc., and pages. BI-PKM This course is presently leaves and debuggers and debuggers and debuggers and other programmer approached indivarticles and other programmer approached indivarious ap	Data Preprocessing Data Preprocessing Data Preprocessing Data Preprocessing Date in the particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Data Preprocessing Date raw data for further processing and analysis. They learn what algorithms can be used to extract information from various date learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characters in Czech. Reverse Engineering Understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decident of the course will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be digging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer reminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Duter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach introduction to Networks. Network Technology 2	Z,ZK ta sources, such ristics from image Z,ZK before and after sticated to reverse edicated to debu er malware scen Z the to failures and the subject is wor chers. The topics Z to to failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics Z to the failures and the subject is wor chers. The topics	a deeper insign a deeper a deee
Students gain a generation shell and some of NI-PDD Students learn to prejime series, etc., and pages. BI-PKM This course is presental students will get acquistions written in the properties of the seminar of Compare approached individual series and other properties and other prop	Data Preprocessing Data Preprocessing Data Preprocessing Data Preprocessing Date in the particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Data Preprocessing Date raw data for further processing and analysis. They learn what algorithms can be used to extract information from various date learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characters in Czech. Reverse Engineering Understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decident of the course will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be digging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer reminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Duter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach introduction to Networks. Network Technology 2	Z,ZK ta sources, such ristics from image Z,ZK ta sources, such ristics from image Z Z,ZK before and after to dicated to reverse edicated to debu er malware scen Z the to failures and the subject is worthers. The topics Z to to failures and the subject is worthers. The topics Z to to failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics Z to the failures and the subject is worthers. The topics	a deeper insign a deeper insig
Students gain a generation shell and some of NI-PDD Students learn to prejime series, etc., and pages. BI-PKM Finis course is presental students will get acquist called. Students will get acquist publications written in the seminar of Comparticles and other programmers. BI-SCE2 The Seminar of Comparticles and other programmers. BI-SCE2 The Seminar of Comparticles and other programmers. BI-SCE3 The Seminar of Comparticles and other programmers. BI-SCE3 The Seminar of Comparticles and other programmers. BI-ST1 The subject is oriented CCNA1 - R&S Ir BI-ST2 This course is presental students will further expenses.	The particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing Data Preprocessing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character into the skills to apply these theoretical concepts of concepts in individual projects - e.g., extraction of character into the sent of the sent of characters in individual projects - e.g., extraction of characters in individual projects - e.g., extrac	Z,ZK ta sources, such ristics from image Z,ZK ta sources, such ristics from image Z,ZK before and after the dicated to reverse edicated to debu er malware scen Z the to failures and the subject is worthers. The topics the subject is worthers. The topics Z the to failures and the subject is worthers. The topics Z the dunder the Ciscon the subject is worthers. The topics Z and BI-ST1 and	a deeper insign a deeper deep a de
Students gain a generation shell and some of NI-PDD Students learn to preprime series, etc., and pages. BI-PKM Finis course is presental students will get acquist so called. Students will get acquist so called. Students witten in debuggers and debuggers and debuggers and debuggers and other propresentations and other propresentations. BI-SCE2 The Seminar of Compare approached individual series and other propresentations. BI-SCE2 The Seminar of Compare approached individual series and other propresentations. BI-ST1 The subject is oriented CCNA1 - R& Sir BI-ST2 This course is presental students will further early students will furth	The particular scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addither particular scripting languages and will get practical experience with shell script programming. Data Preprocessing and analysis. They learn what algorithms can be used to extract information from various da learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character and in Czech. Reverse Engineering Lainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens ill understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is ded 10 ct+. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be digging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer eminars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I Duter Engineering Seminar I Duter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach interesting topic with the selected supervisor. Part of the fessional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach part of the providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredite introduction to Networks. Network Technology 2 Induction to Network Technology 3 Inhance their knowledge acquired from previous BI-ST1	Z,ZK ta sources, such ristics from image Z,ZK ta sources, such ristics from image Z,ZK before and after the dicated to reverse edicated to debu er malware scen Z the to failures and the subject is worthers. The topics the subject is worthers. The topics Z the to failures and the subject is worthers. The topics Z the dunder the Ciscon the subject is worthers. The topics Z and BI-ST1 and	a deeper insign a deeper deep a de

BI-ST4 Network Technology 4 Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switch BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete	efficiency, predictab	ility, extension
Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and st recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mineral possible intra- a	•	
network running. PLOV 1.24 Conjunting Longuages	7 71/	4
BI-SKJ.21 Scripting Languages Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In a	Z,ZK	deeper insight
into shell and some other particular scripting languages and will get practical experience with shell script programming.	addition, and gain a	acopor molgrit
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 of the course will be a few as a little of the course will be a second of the course of the	· · · · · · · · · · · · · · · · · · ·	
and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of the majority of OSes from the application point of values of values of the majority of OSes from the application point of values of val	lew linked to nigner	ievei languages.
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 and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as a corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	by comparing indivivell as indexes of eco	onomic freedom,
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	TOT GISCUSSIONS DAS	sea on maividual
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	e of various variants	and applications
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 even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git ser		articular system
BIE-SEG Systems Engineering	Z	0
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principle	es of operating syst	ems for students
to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After to	-	
understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what	concurrency is, as o	pposed to
parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. TV2K1 Physical Education 2	Z	1
BI-TS1 Theoretical Seminar I	7	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a computer science in the contemporary theoretical computer science in the contemporary	_	
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course		=
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
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 care treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course		-
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	, is a work with sole	nunc papers and
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 contemporary theoretical computer science in the contemporary theoretical computer science.		
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 scie	ntific papers and
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	Z	4
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 c	_	
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course		•
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 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 occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is to learn by examples that occurrence to the course is the course of the course that occurrence to the course that occurrence to the course that occurrence to the course that occurrence the c		· · · · · · · · · · · · · · · · · · ·
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 we	ith built-in-self-test	equipment. They
will be able to compute, analyze, and control the reliability and availability of the designed circuits.		г
BI-QUA Quality Assurance This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the control.	KZ	4
This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the cont development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student s	= =	
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs fou		=
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		_
publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the 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 the process works are the process works.		
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 semest	-	_
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 goal of the class is to introduce basic princip	· ·	students to
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching the		A
BI-TEX TeX and Typography This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of	Z,ZK	4 s on typographic
rules.		o on Gpograpino
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-KSA	Cultural and Social Anthropology	ZK	2
	se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the dive	=	•
· -	h from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	ealth, history, deat	h, etc) will be
shown. The course is p		7	
BI-ULI	Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom	Z	2
	ix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).	e lamiliai with bas	sic commands
BI-OPT	Introduction to Optical Networks	Z,ZK	4
-	view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on p		•
_	ology and on their solutions. The course will include the history of optical communications, an overview of passive componer	•	
dispersion compensato	rs, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sy	stems). The cours	e will also cover
	ics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such		
· · · · · · · · · · · · · · · · · · ·	ansfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters	s. Students will so	lve real tasks
from practice.	Vistorian and Claud Committee	7 71/	
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
_	ledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and Lation principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to eff	-	
-	s of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect		
	x computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical ski		-
and development tools	(Continuous integration and development).		
BI-VHS	Virtual game worlds	ZK	4
	nts to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current s	-	
	neory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world	.The course can b	pe followed by
	the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.	1/7	
BI-VR1	Virtual reality I	KZ	4
	eality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirement the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves c		
and shared social activ		omputational tillil	ung, empany
BI-VR2	Virtual reality II	KZ	3
	rse Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The c	·	-
for computer science a	nd gamification in various social metaverse and desktop engines.		
BI-VAK.21	Selected Applications of Combinatorics	Z	3
The course aims to intr	bduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the	e basic courses, v	we approach the
	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some b		
	tion of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical)		
•	ne solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optim Solutions to the studied problems with a special focus on the effective use of existing tools.	ization and more.	Students will
BI-VMM	Selected Mathematical Methods	Z,ZK	4
	an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then		
	introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the		
	problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.	,	
NI-VYC	Computability	Z,ZK	4
BI-ZS10	rsive functions and effective computability.	7	10
	Bachelor internship abroad for 10 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or	Z research institutio	n Before the
	he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional		
•	rses 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 fore	gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	d into two subjects	if the internship
exceeds the academic			
BI-ZS20	Bachelor internship abroad for 20 credits		
Each student can once		Z	20
	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or	research institutio	n. Before the
internship the Dean of	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess	research institutio	n. Before the I extent of the
internship the Dean of internship. Auxiliary cou	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits	research institutio sional content and correspond to 4 w	n. Before the I extent of the reeks of full-time
internship the Dean of internship. Auxiliary cou	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	research institutio sional content and correspond to 4 w	n. Before the I extent of the reeks of full-time
internship the Dean of internship. Auxiliary cou employment with a fore exceeds the academic	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	research institutio sional content and correspond to 4 w	n. Before the I extent of the reeks of full-time
internship the Dean of internship. Auxiliary cou employment with a fore exceeds the academic BI-ZS30	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line.	research institution in the search institution is in the search in the s	n. Before the dextent of the veeks of full-time if the internship
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and conten	n. Before the d extent of the reeks of full-time if the internship 30 n. Before the d extent of the
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could internship. Auxiliary could internship.	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits	research institutionsional content and correspond to 4 with into two subjects Z research institutionsional content and correspond to 4 with institutionsional correspond to 4 with institutionsional content and correspond to 4 with institutionsional correspond to 4 with institutionsional content and correspond to 4 with institutionsional correspond to 4 with ins	n. Before the I extent of the reeks of full-time if the internship 30 n. Before the I extent of the reeks of full-time
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a fore	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	research institutionsional content and correspond to 4 with into two subjects Z research institutionsional content and correspond to 4 with institutionsional correspond to 4 with institutionsional content and correspond to 4 with institutionsional correspond to 4 with institutionsional content and correspond to 4 with institutionsional correspond to 4 with ins	n. Before the I extent of the reeks of full-time if the internship 30 n. Before the I extent of the reeks of full-time
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line.	research institutionsional content and correspond to 4 with did into two subjects Z research institutionsional content and correspond to 4 with did into two subjects	n. Before the dextent of the reeks of full-time if the internship 30 n. Before the dextent of the reeks of full-time if the internship
internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZIVS	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ	n. Before the dextent of the reeks of full-time if the internship 30 n. Before the dextent of the reeks of full-time if the internship
internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZIVS Intelligent embedded sy	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line.	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to	n. Before the dextent of the reeks of full-time if the internship 30 n. Before the dextent of the reeks of full-time if the internship 4 to teach students
internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a force exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robot	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals retemfundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor rea	n. Before the detected for the reeks of full-time of the internship and n. Before the detected for the reeks of full-time of the internship and the reeks of students ding, application
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robod interfaces, robot navigation.	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals ostem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim to control and development of applications in a graphical development environment. Lectures provide fundamentals of motion of	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor rea	n. Before the detected for the reeks of full-time of the internship and n. Before the detected for the reeks of full-time of the internship and the reeks of students ding, application
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship. Auxiliary could employment with a fore exceeds the academic BI-ZIVS Intelligent embedded simodern humanoid robot interfaces, robot navigatechnologies.	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professionses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals vistem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim tocntrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to g	research institutionsional content and correspond to 4 will dinto two subjects Z research institutionsional content and correspond to 4 will dinto two subjects KZ of the course is to control, sensor real et practical experience.	n. Before the dextent of the reeks of full-time of the internship 30 n. Before the dextent of the reeks of full-time of the reeks of full-time of the internship 4 noteach students ding, application ence with these
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship. Auxiliary could employment with a fore exceeds the academic BI-ZIVS Intelligent embedded simodern humanoid robot interfaces, robot navigatechnologies. BI-ZPI Students will learn functioned internship.	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals retemfundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim toontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of the control and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to generate sengineering amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experi	n. Before the dextent of the veeks of full-time of the internship 30 n. Before the dextent of the veeks of full-time of the internship 4 teach students ding, application ence with these 4 ing and they will
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robot interfaces, robot navigatechnologies. BI-ZPI Students will learn functional earn basics of the used	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rese BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rese BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals retem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim toontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to generate and development of process engineering and this subject. Students will get necessary foundations for understanding formal principles to notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of I	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experious into two subjects KZ of process modell pusiness processes	n. Before the dextent of the deeks of full-time of the internship 30 n. Before the dextent of the deeks of full-time of the internship 4 note and the deeks of full-time of the deeks of full-time of the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship and the deeks of the internship of the internship and the deeks of the internship of
internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary could employment with a fore exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robot interfaces, robot navigatechnologies. BI-ZPI Students will learn functional basics of the user CASE tools. The role of	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals retemfundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim toontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of the control and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to generate sengineering amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experious into two subjects KZ of process modell pusiness processes	n. Before the dextent of the deeks of full-time of the internship 30 n. Before the dextent of the deeks of full-time of the internship 4 note and the deeks of full-time of the deeks of full-time of the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship and the deeks of the internship of the internship and the deeks of the internship of
internship the Dean of internship. Auxiliary couemployment with a fore exceeds the academic BI-ZS30 Each student can once internship. Auxiliary couemployment with a fore exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robo interfaces, robot navigatechnologies. BI-ZPI Students will learn functional basics of the user CASE tools. The role of an enterprise.	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or her FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professions BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals restem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim toontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get Process engineering amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles in totations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of I process engineering for information systems development is discussed as well as its importance in the overall context of information information systems development is discussed as well as its importance in the overall context of information in the overall context of i	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experious into two subjects KZ of process modell pusiness processes	n. Before the dextent of the deeks of full-time of the internship and the deeks of full-time of the deeks of full-time of the deeks of full-time of the internship and the deeks of full-time of the deeks of full-time of the internship and the deeks of full-time of the internship and the deeks of full-time of the internship and the deeks of full-time of the internship of the internship and the deeks of the internship of the
internship the Dean of internship. Auxiliary cot employment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary cot employment with a fore exceeds the academic BI-ZIVS Intelligent embedded signodern humanoid robot interfaces, robot navigatechnologies. BI-ZPI Students will learn functional basics of the user CASE tools. The role of an enterprise. BI-ZNF	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rese BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess rese BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals retem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim toontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to generate and development of process engineering and this subject. Students will get necessary foundations for understanding formal principles to notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of I	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experionsional content and correspond to 5 will into two subjects KZ of the course is to control, sensor real et practical experionsions process modell pusiness processes process	n. Before the dextent of the deeks of full-time of the internship 30 n. Before the dextent of the deeks of full-time of the internship 4 note and the deeks of full-time of the deeks of full-time of the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship of the deeks of full-time of the internship of
internship the Dean of internship. Auxiliary couemployment with a fore exceeds the academic BI-ZS30 Each student can once internship the Dean of internship. Auxiliary couemployment with a fore exceeds the academic BI-ZIVS Intelligent embedded symodern humanoid robo interfaces, robot navigatechnologies. BI-ZPI Students will learn functional learn basics of the user CASE tools. The role of an enterprise. BI-ZNF Students will gain the b	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional study. BI-ZS20, BI-ZS20, BI-ZS20 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Bachelor internship abroad for 30 credits within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess reses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided year's dead-line. Intelligent Embedded System Fundamentals restem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim tontrol and development of applications in a graphical development environment. Lectures provide fundamentals of motion of tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get process engineering amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles in notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of I process engineering for information systems development is discussed as well as its importance in the overall context of informations get process engineering for information systems development is discussed as well as its importance in the overall context	research institutionsional content and correspond to 4 will into two subjects Z research institutionsional content and correspond to 4 will into two subjects KZ of the course is to control, sensor real et practical experionsional content and correspond to 5 will into two subjects KZ of the course is to control, sensor real et practical experionsions process modell pusiness processes process	n. Before the dextent of the deeks of full-time of the internship 30 n. Before the dextent of the deeks of full-time of the internship 4 note and the deeks of full-time of the deeks of full-time of the deeks of full-time of the internship 4 note and the deeks of full-time of the internship 4 note and the deeks of full-time of the internship of the deeks of full-time of the internship of

BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presente	d in Czech.		•
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presente	d in Czech.		'
BI-3DT.1	3D Printing	KZ	4

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

Name of the group: Elective vocational Courses for a Bachelor Specialization BI-WI.21, version 2021 Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADU.21	Unix Administration Zden k Muziká, Petr Zemánek, Miroslav Prágl Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	V
BI-AG2.21	Algorithms and Graphs 2 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	V
BI-ASB.21	Applied Network Security Yelena Trofirnova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (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-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-FBI.21	Financial Business Intelligence David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	Hardware Security Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková T ísková Lenka Kosková T ísková (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B 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-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MGA.21	Multimedia and Graphics Applications Ji í Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip iha 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 (Gar.)	KZ	5	1P+2C	L	V
BI-PNO.21	Practical Digital Design Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	V
BI-PAI.21	Law and Informatics Zden k Ku era, Št pánka Havlíková, Dominik Vítek, Martin Samek, Ji í Maršál, Michal Mat jka Št pánka Havlíková Zden k Ku era (Gar.)	ZK	5	2P+2C	L	V
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	V
BI-PPA.21	Programming Paradigms Jan Janoušek, Tomáš Pecka, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	V

BI-PGA.21	Programming of Graphic Applications Ji í Chludil, Radek Richtr Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3С	Z,L	V
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-SIP.21	Network Programming Jan Fest Jan Fest (Gar.)	Z	5	2P+2C	Z	V
BI-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-SPS.21	Administration of Computer Networks and Services Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	V
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	V
BI-SVZ.21	Machine vision and image processing Marcel Ji ina, Jakub Novák, David Kramný, Justýna Frommová Jakub Novák Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Jaroslav Borecký Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TAB.21	Applications of Security in Technology Ji í Dostál, Jan B Iohoubek, Martin Kolárik, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-TJV.21	Java Technology Stanislav Kuznetsov, Jan Blizni enko, Ji í Dan ek, Raian Samerkhanov Ji í 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-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák David Pokorný Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	V
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	V
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZSB.21	Basics of System Security Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	V

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

BI-MPP.21 Methods of interfacing peripheral devices

Z,ZK

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

3I-MVT.21 Modern Visualisation Technologies

Z,ZK |

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

BI-ADU.21 Unix Administration 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. Algorithms and Graphs 2 Z,ZK BI-AG2.21 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1.21. It further delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.21 BI-ASB.21 Applied Network Security 5 Z.ZK The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks. Architectures of Computer Systems 7.7K 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 Secure Code BI-BEK.21 The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. BI-EPP.21 **Economic Business Processes** The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. Z,ZK BI-EHA.21 **Ethical Hacking** 5 The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-FBI 21 Financial Business Intelligence Z,ZK 5 The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. Z,\overline{ZK} BI-HWB 21 Hardware Security 5 The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. Internet of Things The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS). BI-JPO.21 Computer Units Z,ZK 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). Z.ZK 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-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. Mathematical Logic Z.ZK BI-LOG.21 5 The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained.

BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
	with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for w		
	rill be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to		
- · · · · · · · · · · · · · · · · · · ·	to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the ards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.	ie principie of ope	ration and use
	Object-Oriented Programming	Z,ZK	5
	ming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth		
• •	lainted with the main principles of object-oriented programming and design, used in modern programming languages. The e		-
	which includes testing, error handing, refactoring, and application of design pattern.		•
BI-PGR.21	Computer graphics programming	Z,ZK	5
1	e, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design	the scene, add to	extures imitating
-	terials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		
	e, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe	-	=
·	t, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and st		
	Practical Statistics	KZ	5
	duced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose on and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	-	
methods on data from rea		are it and will app	ny trie studied
	Practical Digital Design	KZ	5
	v of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand	1	-
=	nologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		
tools.		,	, and the second
BI-PAI.21	Law and Informatics	ZK	5
1	to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge	1 1	in the Czech
Republic and will be alert	ted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding c	ontracts in real an	d Internet
environment, will know th	neir responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able	to use commerci	al license types
· ·	s. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	_	
	ch behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of		-
l l	Programming Languages and Compilers	Z,ZK	5
	piling methods of programming languages. They are introduced to intermediate representations used in current compilers		·=
<u>-</u>	a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification	n. The compiler ca	in translate not
	uage but any text in a language generated by a given LL input grammar.	7.71/	5
1	Programming Paradigms sic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of	Z,ZK	_
	and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming		
	on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mair		
such as C++ and Java.			
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
The course will present th	ne possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the	neir use for visualiz	zation of specific
data (3D scenes, mathen	natical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both usin	g built-in scripting	languages and
by implementation of plug			
1	Project management	Z,ZK	5
	to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, ar		
	argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk chedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for		_
	ge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in		
· -	who will develop software or hardware in the form of team projects.	argo companico	
	Network Programming	Z	5
	mental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming network applications.	1 1	
second part is devoted to	designing communication protocols and their verification. The third part introduces the principles and applications of middle	eware technologie	es. The final part
introduces basic modern	models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computing and the practices are proposed and the practices ar	omputer labs using	g a chosen
programming language e	environment.		
	Team Software Project 1	KZ	5
=	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		
	ches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The te		
and finished in the BIE-S	consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	artelact will be lu	rtner developed
		KZ	5
	Team Software Project 2 experience with the iterative development process while working on a large-scale software project. The first iteration is the re	1	_
-	b, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will we		
-	team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their s		, , , , , , , , , , , , , , , , , , , ,
BI-SPS.21	Administration of Computer Networks and Services	Z,ZK	5
	to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administ	1 ' 1	erating 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	d by practical hand	s-on experience
with real network infrastru	ucture.		
BI-ML1.21	Machine Learning 1	Z,ZK	5
-	s to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working		
	he supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relations	•	
	undamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensi and scikit libraries in Python will be used.	שוחם uata visualiza	mon. m practical
		Z,ZK	5
1	Machine Learning 2 s to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in		_
-	he unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction met	•	
	cement learning and natural language processing.	, -	5

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 BI-TAB.21 Applications of Security in Technology Z,ZK 5 The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security. BI-TJV.21 Java Technology 7.7K 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 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks. Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TIS.21 Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-UKB.21 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-VES.21 **Embedded Systems** Z,ZK 5 Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. BI-VDC.21 Virtualization and Data Centers Z.ZK The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses. BI-VIZ.21 Data Visualization The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language. 5 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-FFM 21 Fundamentals of Economics Z,ZK 5 The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. Basics of System Control The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. Z,ZK BI-7SB 21 Basics of System Security The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis. BI-ZUM.21 Artificial Intelligence Fundamentals Z,ZK Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course.

List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
active part in the langu	English language, preparation for the B2 level exam se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both tl ate 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.	ne midterm and the	e final term
BI-AAG.21	Automata and Grammars	Z,ZK	5
and regular grammars,	to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the derstand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity	hierarchy of forma	al languages
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 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM3	Programming Practices 3 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM4	Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
between user and admir	Unix Administration Internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They nistrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the knowledge of user management and virtualization. In the labs, they will verify the knowledge of user management and virtualization. In the labs, they will verify the knowledge of user management and virtualization.	file systems, disk s	subsystems
BI-ADW.1	Windows Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
develops the knowledg algorithm BI-AG2.21	Algorithms and Graphs 1 e basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cu ge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the ns. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asyr Algorithms and Graphs 2 d in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory	time and space conptotic notation.	omplexity of
	data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Eng BIE-AG2.21.		
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AND.21	Programming for the Android Operating System 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		2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
active part in the langu	English language, contact preparation for the B2 level exam se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both tl ate 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.	ne midterm and the	e final term
BI-APJ	Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
pipelined instruction pro not only in scalar prod	Architectures of Computer Systems e construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spe ocessing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the princessors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of orther elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe systems.	ciples of instruction the sequential mo	n processing odel of the
kits and control varied not only on display of	Interactive applications on Arduino for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicate peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students.	ystems, i.e. to see is suitable even fo	the results r Web and
BI-ASB.21	Applied Network Security	Z,ZK	5

DL AV/L 04	Almostilinas viscosilin	7 71/	
BI-AVI.21	Algorithms visually	Z,ZK	4
•	ements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer scie ted in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org<		-
anomicago procon	that make understanding the principles of algorithms easy.	intp.//www.aigov	ioioi ii.oi gagi,,
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
	acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and be	•	_
_	vice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles of the principles will be used as an example of the principles of the principles will be used as an example of the principles of th		
BI-BAP.21	Bachelor Thesis	Z	14
BI-BEK.21	Secure Code	Z,ZK	5
	earn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting far		-
theory, students	s gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every programs are specified by the second	orogram needs t	o run with
administrator private	vileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing d	ata and the rela	tionships of
security and	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	defense agains	t them.
BI-BIG.21	DB Technologies for Big Data	KZ	5
	troduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is for		
	se students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible met		
conection, transion	rmation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretica of individual technologies will be supplemented with specific examples from practice.	i iouridation and	presentation
BI-BLE	Blender	Z,ZK	4
	DieTruer nds knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those in	•	1
	offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphi	ū	•
BI-BPR.21	Bachelor project	7	1
	ng of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the part of the pa	← artial tasks that I	1
-	e semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at th		
	or enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.		
The completed an	d signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the topi	c of the work tha	t the student
has reserved is for	rmulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assign	nment so that the	e assignment
	can be supplemented and approved at the end of the semester.		1:
BI-CCN	Compiler Construction	Z,ZK	5
	ductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of	-	
	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching t	theme of the clas	SS.
BI-CS1	Programming in C#	KZ	4
			1
The goal of the co	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cor	nstruction, types	
The goal of the co operators, array	ourse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin	nstruction, types nition and class i	nstancing,
The goal of the co operators, array	burse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a	nstruction, types nition and class i	nstancing,
The goal of the co operators, array constructors, met	burse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized.	nstruction, types nition and class i and exception pro	nstancing, ocessing, as
The goal of the cooperators, array constructors, methods:	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized. C# language and data access	nstruction, types nition and class i and exception pro- KZ	nstancing, ocessing, as
The goal of the cooperators, array constructors, metal BI-CS2 The C# language	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsco	nstruction, types nition and class in and exception process. KZ oft platform. The	nstancing, ocessing, as 4 students will
The goal of the cooperators, array constructors, metal BI-CS2 The C# language get to know object	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define thods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microscots used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies.	nstruction, types inition and class is and exception process. KZ off platform. The sologies such as	nstancing, occessing, as 4 students will LINQ - a set
The goal of the cooperators, array constructors, metal BI-CS2 The C# language get to know object of features for que	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsco	nstruction, types inition and class i and exception pro KZ off platform. The cologies such as I NQ to Objects, L	nstancing, occessing, as 4 students will LINQ - a set
The goal of the cooperators, array constructors, method by the constructors of the con	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technology and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI	nstruction, types intion and class is and exception process. KZ off platform. The cologies such as INQ to Objects, Ling domain-specialistics.	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects
The goal of the cooperators, array constructors, method by the constructors of the con	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define the class of the content of the con	nstruction, types intion and class is and exception process. KZ off platform. The cologies such as INQ to Objects, Ling domain-specialistics.	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects
The goal of the cooperators, array constructors, method by the constructors of the con	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define thods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsociats 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data us of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model,	nstruction, types intion and class is and exception process. KZ off platform. The cologies such as INQ to Objects, Ling domain-specialistics.	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects
The goal of the cooperators, array constructors, metal BI-CS2 The C# language get to know object of features for que and LINQ to SQI (ORM). This part of BI-CS3	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of	nstruction, types nition and class is and exception process. KZ off platform. The sologies such as INQ to Objects, Loring domain-spectorage Model at KZ	nstancing, occessing, as 4 students will LINQ - a set INQ to XML cific objects and Mapping
The goal of the cooperators, array constructors, method BI-CS2 The C# language get to know object of features for que and LINQ to SQI (ORM). This part of BI-CS3 The students will be	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications	nstruction, types nition and class is and exception process. KZ off platform. The sologies such as INQ to Objects, Loring domain-spectorage Model at KZ	nstancing, occessing, as 4 students will LINQ - a set INQ to XML cific objects and Mapping
The goal of the cooperators, array constructors, method by the construction of the constructio	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define thods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocial Students 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems	nstruction, types nition and class is and exception process. KZ If platform. The cologies such as NQ to Objects, Ling domain-spectorage Model at KZ If the development	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tropossibilities
The goal of the cooperators, array constructors, method by the construction of the con	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define thods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocial Students and Updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LIL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn	nstruction, types nition and class is and exception process. KZ If platform. The cologies such as NQ to Objects, Lining domain-spectorage Model at KZ If the development Z,ZK to design small	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tropossibilities 5 databases
The goal of the cooperators, array constructors, method by the construction of the con	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the States.	nstruction, types nition and class is and exception process. KZ If platform. The cologies such as NQ to Objects, Lining domain-spectorage Model at KZ If the development Z,ZK to design small IQL language, as	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tropossibilities 5 databases s well as with
The goal of the cooperators, array constructors, method by the cooperators, method by the cooperators of the cooperators, method by the cooperators of the cooperators, method by the cooperators of the coop	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class define hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocian 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundament the fundament them in a relational database schema. They understand the fundament them in a relational databa	nstruction, types nition and class is and exception process. KZ If platform. The cologies such as NQ to Objects, Lining domain-spectorage Model at KZ If the development of the develo	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 transaction 5 databases s well as with of transaction
The goal of the cooperators, array constructors, method by the cooperators, method by the cooperators of the coo	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data
The goal of the cooperators, array constructors, method by the cooperators, method by the cooperators of the coo	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technic erying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objects are single data source, as well as recovering a database engine from a failure. They are briefly introduced to bases with respect to speed of access to large quantities of data. This in	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data
The goal of the cooperators, array constructors, method by the cooperators, array constructors, method by the cooperators, method by the cooperators, method by the cooperators are interested by the cooperators are interested from processing, control in relational database.	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions and calls of functions will be discussed. C# language and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsocial sused 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 (LIL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications Detabase Systems Database Systems Introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to create WebAPI and to use it by client programs. Database Systems To constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objective is the relational database and a single data source, as well as recovering a database engine from a failure. They are briefly introduced to bases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of databas	nstruction, types nition and class is and exception provided in the provided i	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and
The goal of the cooperators, array constructors, method by the cooperators, array constructors, method by the cooperators, method by the cooperators, method by the cooperators are interested by the cooperators are interested from processing, control in relational datable.	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corvs, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions, collections, delegates, and generics. Debugging a 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 Microsocia used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies in the directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LIL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications Determined to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to create user of the relational database engine architecture and typical user roles. They are briefly introduced to various database engine with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objective introduced to speed of access to large quantities of data. This introductory-level course does not cover: Admi	nstruction, types nition and class is and exception provided in the second of the seco	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and
The goal of the cooperators, array constructors, method processing, control of the cooperators, array constructors, method processing, control of the cooperators will be considered by the cooperators of	Directed to the course introduce NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cores, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions, and calls of functions will be discussed. C# language and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsc cts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn a constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objective places are some places of access to a single data source, as well as recovering a database engine from a failure. They are briefly introduce	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 oe explained.
The goal of the cooperators, array constructors, method processing, control of the cooperators, array constructors, method processing, control of the cooperators will be considered by the cooperators of	Directed to the course introduce NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cores, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, loops, delegates, and generics. Debugging a 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 Microsc acts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objects with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administra	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set INQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 oe explained.
The goal of the cooperators, array constructors, method processing, control of the cooperators, array constructors, method processing, control of the cooperators will be considered by the cooperators of	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized. C# language and data access and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsc is used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologiery and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI L). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induded to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the S dation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to passes with respect to speed of access t	nstruction, types nition and class is and exception provided in the provided i	nstancing, occessing, as 4 students will LINQ - a set INQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 oe explained, the basics of
The goal of the cooperators, array constructors, method processing constructors, method by the cooperators, method by the cooperators, method by the constructors, method by the construction of the cooperators of the cooper	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cors, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technication and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications Database Systems Introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Stational database model. They learn the principles of normalizing a relational database schema. They understand the fundan colling parallel user access to a single data source, as well as recovering a database engine. They get a hands-on experience with the Stational database engine from a failure. They are briefly introduce	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 pe explained, the basics of
The goal of the cooperators, array constructors, method processing constructors, method by the cooperators, method by the cooperators, method by the constructors, method by the cooperators, method by the cooperators of features for question and LINQ to SQL (ORM). This part of the cooperators of features for question and LINQ to SQL (ORM). This part of the cooperators of features will be a support of the cooperators of the coope	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corys, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized. C# language and data access and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsc is used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologiery and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI L). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induded to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the S dation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to passes with respect to speed of access t	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 pe explained the basics of 5 eir possible
The goal of the cooperators, array constructors, method processing control of the cooperators, method processing, control in relational databox of the cooperators will get a Special attention is special of the cooperators.	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cors, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsocts 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 (LL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data us of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications Per introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the Station - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan obling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to passes with respect to speed of access to large quantities of	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 pe explained the basics of 5 eir possible
The goal of the cooperators, array constructors, method processing constructors, method by the cooperators, method by the cooperators, method by the constructors, method by the cooperators, method by the cooperators of features for question and LINQ to SQL (ORM). This part of the cooperators of features for question and LINQ to SQL (ORM). This part of the cooperators of features will be a support of the cooperators of the coope	Durse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corps, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsc cts 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the adation-the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to bases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database swith respect to speed of access to large quant	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transaction storing data bugging and 5 pe explained the basics of 5 eir possible
The goal of the cooperators, array constructors, method processing control of the cooperators, array constructors, method processing control of the cooperators will be considered by the cooperators of the cooperators will be considered by the cooperators of th	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corps, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized. C# language and data access C# language and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsot state of certrieve 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the principles of normalizing a relational database schema. They understand the fundant of the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant of the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundance of the relations of the respect to speed of access to large quantities of data. This i	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transactior storing data bugging and 5 pe explained the basics of 5 eir possible erience with
The goal of the cooperators, array constructors, method processing control of the cooperators, array constructors, method processing control of the cooperators will be considered by the cooperators of the cooperators will be considered by the cooperators of th	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corps, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a well as work with files are emphasized. C# language and data access C# language and data access can data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micross ts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologing and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML, and SQL (LILL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data used the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn or constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the S dation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundant objects are presented to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database path respect to speed	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 tt possibilities 5 databases s well as with of transactior storing data bugging and 5 pe explained the basics of 5 eir possible erience with
The goal of the cooperators, array constructors, method processing control of the students will be students will be students will go the students are intificial found processing, control in relational datable students will get as Special attention is BI-EHA.21 The goal of the coexploid the students will be students will get as Special attention in correct students.	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental core, so, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defineds, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsca used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies of verified to the course of the course introduces and call the course introduces and patents. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Troduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the principles of normalizing a relational database schema. They understand the fundan oilling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to cases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database optimizing database applications, distributed database systems, data stores. Discrete Mathematics and Logic acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws.	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 at possibilities 5 databases s well as with of transactior storing data bugging and 5 pe explained the basics of 5 eir possible erience with 3
The goal of the cooperators, array constructors, method processing constructors, method processing, control in relational datable and LINQ to SQI (ORM). This part of the students will be a BI-DBS.21 Students are interested from processing, control in relational datable BI-DML.21 Students will get a special attention is BI-EHA.21 The goal of the coexploitation in correct some processing control in relational datable BI-EHA.21 The goal of the coexploitation in correct BI-EHD BI-EJA	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental core, so, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsc stus used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technering and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Toduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to create WebAPI and to use it by client programs. Database Systems Toduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the principles of normalizing a relational database engine rom a failure. They are briefly introduced to bases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of databases with respect to s	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 at possibilities 5 databases s well as with of transactior storing data bugging and 5 pe explained the basics of 5 eir possible erience with 3
The goal of the cooperators, array constructors, method processing control of the students will be students are int (including integrity its theoretical found processing, control in relational datable special attention is BI-EHA.21 The goal of the coexploid operators are int (including integrity its theoretical found processing, control in relational datable special attention is BI-EHA.21 The goal of the coexploidation in corrections are integrity in relational datable.	purse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental corfus, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsc at used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technerying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI L). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data us of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications to introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems roduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the principles of normalizing a relational database schema. They understand the fundan obling parallel user access to a single data source, as well as recovering a database engine. They get a hands-on experience with the S dation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundan object programs are plated to specify the programs and the fundance of the relations, their general properties,	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 at possibilities 5 databases s well as with of transaction storing data bugging and 5 be explained. the basics of 5 eir possible erience with 3
The goal of the cooperators, array constructors, method processing of features for que and LINQ to SQI (ORM). This part of the students will be a superior of the students will be a superior of the students will be a superior of the students are into the students a	ourse is to introduce. NET Framework as a multi-language development platform. Then, programming language C#, its fundamental coris, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definitions, delegates, and generics. Debugging a 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 Microscites 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 (LI L). Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems roduced to the database engine architecture and typical user roles. They are briefly introduced to various database model. They learn the principles of normalizing a relational database schema. They understand the fundan olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to sasses with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database spell and the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from so paid to relations, their general properties, and their type	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 the possibilities 5 databases s well as with of transaction storing data bugging and 5 be explained. the basics of 5 eir possible erience with 3 4 connected to 4
The goal of the cooperators, array constructors, method processing control of the cooperators, array constructors, method processing control of the cooperators are interested from the cooperators will be considered by the cooperators of the	purse is to introduce. NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cories, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a 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 Microsot at used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technorying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (UL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data us of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn the principles of normalizing a relational database schema. They understand the fundan obling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to passes with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of databases with respect to speed of access to large quantities of data. This introductory-level course does not cover	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 the possibilities 5 databases s well as with of transaction storing data bugging and 5 be explained. the basics of 5 eir possible erience with 3 4 connected to 4
The goal of the cooperators, array constructors, method processing constructors, method processing, control in relational datable bl-EHA.21 The goal of the coexploitation in cordinate is a series of the coexploitation in cordinate bl-EJA The course is on a series of the coexploitation in cordinate construction in the coexploitation in cordinate bl-EJA The course is on a series of the coexploitation in cordinate construction in	Date is to introduce. NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cor is, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined hods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging is 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 Microsc usued to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technerying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LI), Another objective is the Entity Framework - an object-relational mapper that enables. NET developers to work with relational data use of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, (XML description). Language C# - design of web applications le introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of on thisplatform. They will learn to create WebAPI and to use it by client programs. Database Systems Induced to the database engine architecture and typical user roles. They are briefly introduced to various database model. They learn the principles of normalizing a relational database schema. They understand the fundant oliling parallel user access to a single data source, as well as recovering a database engine. They get a hands-on experience with the S database with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database optimizing database applications, distributed database engine from a failure. They are briefly introduced	nstruction, types nition and class is and exception provided in the provided i	nstancing, ocessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping 4 the possibilities 5 databases s well as with of transaction storing data bugging and 5 be explained. the basics of 5 eir possible erience with 3 4 connected to 4

BI-EP2 Efficient Programming 2 ΚZ 4 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors. BI-FPP21 **Economic Business Processes** The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-FBI.21 Financial Business Intelligence Z,ZK The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-FEM.21 Fundamentals of Economics Z,ZK 5 The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Inteligence moduls in Business information systems. **BI-GIT** K7 2 Version control system GIT Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practically. In this particular systems 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 administrators. 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-HAM HW accelerated network traffic monitoring K7 This course introduces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The monitoring and analysis of network traffic are mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a source of information and data for analysis). The goals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic on a hardware and software level and to develop their practical abilities in this field. **BI-HAS** Human Aspects in Cryptography and Security Z,ZK 5 This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for developers. 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 The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. Z,ZK BI-IDO.21 Introduction to DevOps 5 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-IOS** Fundamentals of iOS Application Development for iPhone and iPad ΚZ 4 This course is presented in Czech. BI-IOT.21 Internet of Things Z,ZK 5 The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS). BI-JPO.21 Computer Units Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-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 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** 4 Programing in Kotlin Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advanced language constructions. The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a modern, object-functional way with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages). **BI-KSA** Cultural and Social Anthropology 7K The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, health, history, death, etc ...) will be shown. The course is presented in Czech. BI-LA1.21 Linear Algebra 1 We will introduce students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of real and complex numbers and also over finite fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimination method (GEM) and show the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenvalues and eigenvectors of a matrix. We will also demonstrate some applications of these concepts in computer science. BI-LA2.21 Linear Algebra 2 Z,ZK 5 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech. BI-LOG.21 Mathematical Logic The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained. BI-MA1.21 Mathematical Analysis 1 We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms. Mathematical Analysis 2 BI-MA2.21 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 3 The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type and the data formats used for that data type along with tools available to work with such data. After finishing the course, the students should know how to work with common data, e.g. on the Web. 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. Mikrotik technologies **BI-MIT** 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 Z.ZK Machine Learning 1 5 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 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. BI-MMP ΚZ Multimedia team project 4 This course is presented in Czech. BI-MPP.21 Methods of interfacing peripheral devices Z.ZK 5 The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices. BI-MVT.21 Modern Visualisation Technologies Z,ZK The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning. BI-OOP.21 Object-Oriented Programming Z,ZK 5 Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphasis is on practical techniques for developing software, which includes testing, error handing, refactoring, and application of design pattern.

BI-OPT	Introduction to Optical Networks	Z,ZK	4
Students get basic	overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on poss	ible problems with	deployment
of optical network	technology and on their solutions. The course will include the history of optical communications, an overview of passive components	s (optical fibres, mu	ıltiplexors,
	sators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission syster	•	
•	e topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as		
ultrastable freque	ncy transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters.	Students will solve	real tasks
	from practice.		
BI-ORL	Operations Research and Linear Programming	KZ	5
•	o introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundar	•	
· · · · · · · · · · · · · · · · · · ·	nal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (suc	h as management	·
BI-OSY.21	Operating Systems	Z,ZK	5
	a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp		
critical regions, thre	ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS moni		le to design
	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W		
BI-PA1.21	Programming and Algorithmics 1	Z,ZK	7
•	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, struc		•
statements, function	ons, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchi	ng, sorting, and m	anipulating
	with linked lists and trees.		
BI-PA2.21	Programming and Algorithmics 2	Z,ZK	7
	instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que		•
table). They lear	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e	e.g., template prog	amming,
	copying/moving of objects, operator overloading, inheritance, polymorphism).		
BI-PAI.21	Law and Informatics	ZK	5
	urse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of	_	
•	Il be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding co		
	now their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to		
	censes. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection a	•	
	ted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of		
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
· · · · · · · · · · · · · · · · · · ·	sent the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their		· ·
data (3D scenes, n	nathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using b	uilt-in scripting lang	guages and
DI DOD 04	by implementation of plugins.	7 714	
BI-PGR.21	Computer graphics programming	Z,ZK	
_	curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the		_
•	nd materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and ter	•	
	pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing	-	=
-	pment, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surface		
BI-PHP.1	Programing in PHP	KZ	4
	ught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a		
development in i	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for their 2nd appropriate for their 2nd appropriate for their	or BIE-TWA.1. The	y snoula
DI DI IDO4	register for this course in their 3rd semester of study.	1/7	
BI-PHP.21	Programing in PHP	KZ	5
	se is an introduction to the PHP language and technology. Students will learn also best practices and will use tools that make develop		
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G		,
create a specificat	ion of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. T	ne compiler can tr	ansiale not
DI DIC 4	only a programming language but any text in a language generated by a given LL input grammar.	1/7	4
BI-PJS.1	JavaScript Programming	KZ	4
•	course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1.They should register for th	•	
recommended for s	of study.	iis course iii trieii 4	iii seillesiel
DI DIC 04	·	V7	5
BI-PJS.21	JavaScript Programming		
	· · · · · · · · · · · · · · · · · · ·	KZ	
BI-PJV	introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code development of the code in the code	ppment in Javascri	ot easier.
Dirov	introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code developments of the programming in Java		
	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	ppment in Javascri Z,ZK	ot easier. 4
BI-PKM	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics	ppment in Javascri	ot easier.
BI-PKM	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	ppment in Javascri Z,ZK Z	ot easier. 4
	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics	ppment in Javascri Z,ZK	ot easier. 4
BI-PKM BI-PMA	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programming)	zyment in Javascri Z,ZK Z Z,ZK	4 4 4
BI-PKM BI-PMA	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Programming in Mathematica	Z,ZK Z,ZK Z,ZK Z,ZK ing, rule-based pr	4 4 4
BI-PKM BI-PMA Students will be wo	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design	Z,ZK Z,ZK Z,ZK ing, rule-based pr	4 4 ogramming,
BI-PKM BI-PMA Students will be wo	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	Z,ZK Z,ZK Z,ZK ing, rule-based pr	4 4 ogramming,
BI-PMA Students will be wo BI-PNO.21 Students get an ov	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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	Z,ZK Z,ZK Z,ZK aing, rule-based pr KZ basics of the VHD	4 4 ogramming, 5 L language
BI-PMA Students will be wo BI-PNO.21 Students get an ov	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools.	Z,ZK Z,ZK Z,ZK aing, rule-based pr KZ basics of the VHD	4 4 ogramming, 5 L language
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms	Z,ZK Z,ZK and the very standard C. Z,ZK	4 4 ogramming, 5 L language AD design 5
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals w	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programment), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms ith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par	Z,ZK TZ,ZK Aing, rule-based pr KZ basics of the VHD dustry-standard C. Z,ZK ticular approaches	4 4 ogramming, 5 L language AD design 5 . Functional
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals we programming parace	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmet.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms ifth basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paraligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The	Z,ZK TZ,ZK Aing, rule-based pr KZ basics of the VHD dustry-standard C. Z,ZK ticular approaches the principles are defined.	4 4 4 ogramming, 5 L language AD design 5 . Functional
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals we programming parace	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmetc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms ith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paraligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The sand on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstr	Z,ZK TZ,ZK Aing, rule-based pr KZ basics of the VHD dustry-standard C. Z,ZK ticular approaches the principles are defined.	4 4 4 ogramming, 5 L language AD design 5 . Functional
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals we programming paracon lambda calculur	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmet.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms ith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paraligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The sand on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstrance and such as C++ and Java.	Z,ZK and the VHD dustry-standard C. Z,ZK ticular approaches are deeam programming	4 4 ogramming, 5 L language AD design 5 . Functional monstrated languages
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals w programming parac on lambda calculur BI-PRR.21	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programment), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design erview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the contect technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in tools. Programming Paradigms with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paraligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The sand on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstrance such as C++ and Java. Project management	Z,ZK apprent in Javascri Z,ZK Z,ZK aing, rule-based pr KZ basics of the VHD dustry-standard C. Z,ZK ticular approaches the principles are defeated principles are defea	4 4 ogramming, 5 L language AD design 5 . Functional imonstrated languages 5
BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals we programming paract on lambda calculur BI-PRR.21 The aim of the co	Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programmet.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design 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 tools. Programming Paradigms ith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of paraligm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The sand on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstrance and such as C++ and Java.	Z,ZK ticular approaches are deeam programming Z,ZK ysis, crisis manager Z,ZK ysis, crisis manager Z,ZK	4 4 ogramming, 5 L language AD design 5 . Functional emonstrated languages 5 ement in a

Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects. BI-PRS.21 **Practical Statistics** The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose models fitting the data. The course will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software R and will apply the studied methods on data from real problems. Programming in shell 2 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming BI-PSI.21 Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. BI-PST.21 Probability and Statistics Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical hypotheses and determining the statistical dependence of two or more random variables. BI-PYT.21 Python Programming ΚZ 5 The aim of the course is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data processing. The differences between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format of a Jupyter notebook, which enables greater accent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester work will be assigned during the semester. Quantum algorithms and programming **BI-QAP** Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on which quantum technologies are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development kit Qiskit, which is based on Python language. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM and experience with Python might be an advantage. No previous knowledge of physics is assumed. **BI-QUA Quality Assurance** This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of different types of software development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should be prepared to perform a test analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found in the product under test. BI-SAP.21 Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithmetic-logic unit, controllers, memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple processor is practically implemented in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. Computer Engineering Seminar I The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. BI-SCE2 Computer Engineering Seminar II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. **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 individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite. **Network Programming** The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming using BSD sockets. The second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware technologies. The final part introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computer labs using a chosen programming language environment. BI-SKJ.21 Scripting Languages Z,ZK Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming. BI-SOJ Machine Oriented Languages Z,ZK Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use of microprocessor's features and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view linked to higher level languages. This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 ΚZ Team Software Project 1 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	KZ	5
•	s-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result		
	ollow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work		ople. The
BI-SPS.21	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 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 an	•	
	d. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Orac	•	٠ ١
	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.		- 1
lectures will be exp	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are	e the same as in the	e BIE-VES
BI-ST1	course. Network Technology 1	7	3
ı	ented 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
	This course is presented in Czech.	'	
BI-ST3	Network Technology 3	Z	3
	r enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during B		
get further extend	led in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predi simple topology, security, etc.	ctability, extension	beyond a
BI-ST4	Network Technology 4	7	3
- 1	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	_ ,	
BI-ST2 courses go	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficient	ency, predictability,	extension
	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely		`
•	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigatic		
recoveries, and en	network running.	on ways wrille main	tailing the
BI-STO	Storage and Filesystems	Z,ZK	4
The student will lea	rn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi	ving, as so as stora	ige scaling,
	load balancing and high availability.		
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	-	
introduces students	problems of practice that the graduates may encounter.	or carriera systems	s ioi solvilig
BI-SWI.21	Software Engineering	Z,ZK	5
Students get acqua	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-		
-	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	-	he course,
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	· '	
3	cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware	•	
BI-TDA	Test driven architecture	KZ	4
	used on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are		
	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 occur		
BI-TDP.21 The course is focus	Documentation and Presentation ed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fire.	KZ	3 s Students
	of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese	-	
	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		
	exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.		
BI-TEX	TeX and Typography	Z,ZK	4
inis course is prese	ented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the c rules.	course tocuses on t	ypographic
BI-TIS.21	Information Systems	Z,ZK	5
	urse is to familiarise students with the information systems topic and information systems implementation principles. During the cours		
-	isting types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other		
	al part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa	-	
-	d information system implementation based on the project management principles. The emphasis is on the initial customer analysis,	=	- 1
	better to implement any existing information system or to develop a new one from scratch. These factors determine the information system fthe course information systems security, operation, support, maintenance, legislation impacts, and government information systems		
BI-TJV.21	Java Technology	Z,ZK	5
	de knowledge and skills for developing information systems and applications through concepts used in software development and exp		
	from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.		

BI-TPS.21 Computer Networks Technologies Z,ZK 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TS1 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 Ζ Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Ζ Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Z,ZK BI-TUR.21 User Interface Design Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BI-TWA.21 Design of Web Applications The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React. BI-TZP.21 Technological Fundamentals of Computers 5 Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-UKB.21 Introduction to Cybersecurity 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 2 Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become 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). Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell. Selected Applications of Combinatorics BI-VAK.21 3 The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BI-VDC.21 Virtualization and Data Centers The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses BI-VFS.21 **Embedded Systems** Z,ZK Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. **BI-VHS** Virtual game worlds ZK The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices BI-VIZ.21 Data Visualization ΚZ The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language.

BI-VMM	Selected Mathematical Methods	Z,ZK	4
_	s with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then ad		
	r, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the w		e examine
	he linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interestin		
BI-VPS.21	Selected Topics in Computer Networking John the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technology.	Z,ZK	5
	al area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical	-	-
	vices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance	•	, a
BI-VR1	Virtual reality I	KZ	4
	ual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of	l I	=
The course focus	es on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves con	nputational thinking	j, empathy
	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, spatial computing and social life of avatars. The obje	ctive is to develop a	applications
	for computer science and gamification in various social metaverse and desktop engines.		
BI-VWM.21	Searching the Web and Multimedia Databases	Z,ZK	5
=	ic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage		-
	information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from a Firity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web se		
Knowledge of Silling	data types (documents).	arch engines for the	riientionea
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
_	ed system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of t		
modern humanoid	robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control	rol, sensor reading.	application
interfaces, robot na	avigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get p	ractical experience	with these
	technologies.		
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain t	he basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech po	pular framework. T	he resulting
	knowledge should serve for the efficient creation of a web backend in PHP language.		
BI-ZPI	Process engineering	KZ	4
	fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process and process engineering in this subject. Students will get necessary foundations for understanding formal principles of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process.	_	-
	used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of busi ble of process engineering for information systems development is discussed as well as its importance in the overall context of inform	· ·	-
ONOL 10013. THE I	an enterprise.	ation and business	Strategy of
BI-ZRS.21	Basics of System Control	Z,ZK	5
	an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus		-
control of engine	ering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description	n methods of syste	m models,
basic linear dynam	ic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creat	ing a description of	the system
	linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given		
control loops, issu	es of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial	implementation of	continuous
DI 7040	and digital controllers and PLC control.	7	40
BI-ZS10	Bachelor internship abroad for 10 credits nonce within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re	Z	10
	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professic		
· ·	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
	foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided int	•	
. ,	exceeds the academic year's dead-line.	,	
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re	search institution.	Before the
internship the De	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profession	nal content and ex	tent of the
internship. Auxiliar	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr	respond to 4 weeks	s 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 internship is 30 credits.	o two subjects if the	e internship
	exceeds the academic year's dead-line.		
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re		
· ·	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professic y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
	foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided int	-	
omploymont with a	exceeds the academic year's dead-line.	o two oubjects ii tir	o intorrioriip
BI-ZSB.21	Basics of System Security	Z,ZK	5
	purse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forens		
such as malware	analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder	n operating system	ns security,
	as well as skills needed for independent work in the area of operating system security incident analysis.		
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	troduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed		
	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also the context of the course can be represented for example by a physical robot, but also the context of the course can be represented for example by a physical robot, but also the context of the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot, but also the course can be represented for example by a physical robot can be represented for example by a physical robot can be represented for example by a physical robot can be represented for example by a physical r		entity, such
	virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art di		
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
DIE COI	This course is presented in Czech.		
BIE-CSI	Introduction to Committee Colores	7	0
This is an intraduct	Introduction to Computer Science	Z Z	2
	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fi	elds but interested	in computer
science, high-sch	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fit ool students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go	elds but interested of the class is to	in computer introduce
science, high-sch	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fi	elds but interested of the class is to	in computer introduce

done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected, or even less than before. **BIE-DIF** Differential equations This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential solution methods like separation of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with methods like characteristic polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications. Finally, an introduction to partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. **BIE-EEC** Ζ English language external certificate 4 The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding the B2 level of the Common European Framework of Reference for Languages. BIF-IMA2 Introduction to Mathematics 2 7 2 Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Z **BIE-SEG** Systems Engineering 0 This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of operating systems for students to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the class, students are able to understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concurrency is, as opposed to parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. **BIE-ZUM** Artificial Intelligence Fundamentals Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well. Academic writing Publishing is an important and required part of research activity. It is not only about obtaining research results but also about applying them in the form of publication. Writing scientific publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the course, students will learn how to write a scientific article, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an article and reviewing someone 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 determined based on the availability of enrolled students. NI-AFP Applied Functional Programming ΚZ 5 This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming languages are on the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mastering this paradigm becomes a necessary competence of a software engineer: the theory and especially the practice. NI-DDM Distributed Data Mining ΚZ 4 Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands on experience with large scale data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations and will be capable to propose approaches to parallelize other algorithms. The course is prezented in czech language. NI-DSP Z,ZK **Database Systems in Practes** 4 This course is presented in Czech. NI-DZO Digital Image Processing This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms that are both easy to implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also valuable outside the domain of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR compression, de-blurring in frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversion, context enhancement, interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, adding depth, alpha matting. Internet and Multimedia The NI-IAM course is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acquisition of AV signals (input), 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 audiovisual transmissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effect of various components 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 the scene up to the presentation for audience Statistical Modelling Lab The subject is oriented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is put on the effective use of the available information and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and analyses of their properties. At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis). NI-MOP Modern Object-Oriented Programming in Pharo Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where its ability to natural abstraction is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills of design and implementation of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development needs and areas of interest. In addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work on interesting projects and OO technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvement in the Pharo Consortium. NI-MPL Managerial Psychology ZK 2 Mathematical Structures in Computer Science Z.ZK 4 NI-MSI Mathematical semantics 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 The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining powerful processors and FPGAs increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development for master's students. The course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience.

NI-PDD	Data Preprocessing	Z,ZK	5
	pata Treprocessing repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s	'	1
	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris		•
time series, etc., a	pages.	dos nom images c	n nom web
NI-PSD		KZ	4
	Public Services Design		1 -
	roduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p	•	•
suppliers (devs a	and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	n with client repres	sentatives.
NII DOI	Course is aimed at students-designers as well as clients.	7.71/	
NI-PSL	Programming in Scala	Z,ZK	4
	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featur	٠.	•
advance standard i	ibrary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and	libraries e.g. Play	, Cassandra,
	Scalaz, etc.		
NI-REV	Reverse Engineering	Z,ZK	5
	equainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before the computer software.		
	will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated as a contract of the course of the course is dedicated as a contract of the course		
* *	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be di	•	•
debuggers and de	ebugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer	malware scene. I	he focus of
	the course is on the seminars, where students will solve practically oriented tasks from the real world.		_
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds	upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	arious variants and	applications
	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
NI-TSP	Testing and Reliability	Z,ZK	5
Students will gain	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre	pare a test set witl	n the help of
the intuitive path se	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu	ilt-in-self-test equi	pment. They
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will ga	in knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	organizations. Th	ey will get
acquainted with vi	rtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	ently operate and o	optimize the
performance pa	rameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology tod	ay for the
management of co	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in	n the use of moder	n integration
	and development tools (Continuous integration and development).		
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.	,	1
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVK1	Physical Education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
	1 Hydrodi Oddoddori	_	

For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2025-04-18, time 20:30.