Study plan

Name of study plan: Bachelor Specialization Computer Science, in Czech, 2021

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

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

Required credits: 153 Elective courses credits: 27 Sum of credits in the plan: 180

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

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

Janoušek, Ph.D., email: jan.janousek@fit.cvut.cz

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 106

The role of the block: PP

Code of the group: BI-PP.21

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

2021

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

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

Credits in the group: 106

Note on the group:

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

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

BI-MA1.21	Mathematical Analysis 1 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-MA2.21	Mathematical Analysis 2 Pavel Hrabák, Tomáš Kalvoda, 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. 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 exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.

learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present it in front of classmates and the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the

Unix-like Operating Systems

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

Name of the block: Compulsory courses in the specialization

Minimal number of credits of the block: 40

The role of the block: PS

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

Name of the group: Compulsory Courses for Specialisation Computer Science, version 2021

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

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

Credits in the group: 40 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-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	PS
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-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	PS
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	PS
BI-PPA.21	Programming Paradigms Jan Janoušek, Tomáš Pecka, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	PS
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	PS

Characteristics of the courses of this group of Study Plan: Code=BI-PS-TI.21 Name=Compulsory Courses for Specialisation Computer Science, version 2021

BI-AG2.21 Algorithms and Graphs 2 Z,ZK 5 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-APS,21 **Architectures of Computer Systems**

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

Z,ZK

Z,ZK

Z,ZK

 Z, \overline{ZK}

5

BI-LA2.21 Linear Algebra 2

Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech.

Mathematical Logic

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-OOP.21 Object-Oriented Programming

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-PJP.21 **Programming Languages and Compilers**

Z.ZK Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers GNU and LLVM. They learn to create a specification of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. The compiler can translate not only a programming language but any text in a language generated by a given LL input grammar.

BI-PPA.21 **Programming Paradigms**

The course deals with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of particular approaches. Functional programming paradigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The principles are demonstrated on lambda calculus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstream programming languages such as C++ and Java.

BI-ZUM.21 Artificial Intelligence Fundamentals

Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course.

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-TI.21

Name of the group: Compulsory elective courses of the specialization Computer Science, 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-SWI.21	Software Engineering Michal Valenta, Ji í Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	PV
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	PV

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

BI-SWI.21 Software Engineering

Z,ZK

5

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-ML1.21 Machine Learning 1

z,ZK

5

The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working 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.

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

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.21

Name of the group: Compulsory Physical Education, version 2021

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

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

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

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group:

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

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BI-ANG1, ending with an exam for two credits, is enrolled by students who prepared for the exam independently and do not have credit from BI-A2L. These students must complete a credit paper before their own exam. After passing the exam, the student will also be recognized for the course BI-ANGS (Independent preparation for the English exam) for 2 credits.

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

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

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

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2				
BIE-EEC	English language external certificate	Z	4				
The BIE-ECC course ca	he BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding						
the B2 level of the Com	mon European Framework of Reference for Languages.						
BI-ANG	English Language, Internal Certificate	ZK	2				
Course information and	teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG						

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

The role of the block: V

Code of the group: BI-V.2021

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

2024/25

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

Credits in the group: 0 Note on the group:

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

BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	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	V
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 one of the traditional programming paradiams. Traditional and navel 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	soomanvoo.
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 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	ı	_,,	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. The state in a mor got to line in the competition in	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		-
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This is a selective cou	Programming Practices 2	KZ	5
	se for preparing talented student for representation in international programming contests.		T
BI-ACM3	Programming Practices 3	KZ	5
	se for preparing talented student for representation in international programming contests.	1/7	
BI-ACM4	Programming Practices 4	KZ	5
	se for preparing talented student for representation in international programming contests.	1/7	4
BI-AND.21	Programming for the Android Operating System	KZ	4
This course is presente		1/7	4
	Programming in C# is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental	KZ	
•	s, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		
	properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggii		_
vell as work with files		3	J, J, .
3I-PJV	Programming in Java	Z,ZK	4
This course is present	ed in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	,	ļ.
BI-PJS.1	JavaScript Programming	KZ	4
	e is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development	t in Javascript. Th	ne course is
_	ents 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.			
BI-KOT	Programing in Kotlin	Z,ZK	4
Cotlin is a modern, sta	ically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advantage	anced language	constructions.
he language is fully J	ava compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of	a modern, object	t-functional wa
	-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
NI-PSL	Programming in Scala	Z,ZK	4
	the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature		_
	ry. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a	and libraries e.g.	Play, Cassand
Scalaz, etc.			
BI-PMA	Programming in Mathematica	Z,ZK	4
	g with modern technical and scientific software. Students will learn how to use different programming styles (functional program	mming, rule-base	ed programmi
	namic interactive applications and visualisations, data processing and presentations.		
3I-PHP.1	Programing in PHP	KZ	4
-	Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a		
•	he course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register f	or BIE-TWA.1. T	hey should
	in their 3rd semester of study.		
BI-PS2	Programming in shell 2	Z,ZK	4
	al overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add	lition, they gain a	deeper insig
	ner particular scripting languages and will get practical experience with shell script programming.		
NI-PDD		· ·	-
24 1 4 1 4 4	Data Preprocessing	Z,ZK	5
	are raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data	a sources, such	as images, tex
time series, etc., and le	· · · · · · · · · · · · · · · · · · ·	a sources, such	as images, tex
ime series, etc., and lo	are raw data for further processing and analysis. They learn what algorithms can be used to extract information from various dat earn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character	a sources, such a stics from image	as images, texes or from web
ime series, etc., and lo pages. BI-PKM	are raw data for further processing and analysis. They learn what algorithms can be used to extract information from various date earn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character Introduction to mathematics	a sources, such	as images, tex
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ime series, etc., and le pages. BI-PKM This course is present NI-REV	are raw data for further processing and analysis. They learn what algorithms can be used to extract information from various date earn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character introduction to mathematics and in Czech. Reverse Engineering	a sources, such istics from image	as images, texes or from web
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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 e 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 sw recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the miti		•
network running. PLOV 1.24 Conjugate and a programme of the conjugate and the conju	7.71/	1
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 ddition, they gain a	4 deeper insight
into shell and some other particular scripting languages and will get practical experience with shell script programming.		
BI-SOJ Machine Oriented Languages	Z,ZK	4
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 optim and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of vi	· · · · · · · · · · · · · · · · · · ·	
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	ew linked to riigher	lever lariguages.
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 be and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as we		
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	of discussions bas	sed on individual
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite. 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	1 '	-
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 peven the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve		articular system
BIE-SEG Systems Engineering	7	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	_	
to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After tall	-	
understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what c	oncurrency is, as o	ppposed to
parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. TV2K1 Develop Education 2	Z	1
TV2K1 Physical Education 2 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 classical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical seminar is intended for students which want to come in deeper contact with 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		-
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 clause 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.	io a nom min colo	nune papere 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 classification of 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.	is a work with scie	ntific papers and
BI-TS4 Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical seminar is intended for students which want to come in deeper contact with 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.		T .
BI-TDA Test driven architecture The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that	KZ	the DovOns
world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur		•
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 will be able to compute applying and control the reliability and explicitly of the designed circuits.	th built-in-self-test of	equipment. They
will be able to compute, analyze, and control the reliability and availability of the designed circuits. BI-QUA Quality Assurance	KZ	4
This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context.	1	· -
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student shades a student		
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs four		
FI-TOP Academic writing Publishing is an important and required part of received activity. It is not only about obtaining received required but also about applying them in the fi	Z	Writing acientific
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 functions 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		
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 semeste	r. Dates will be dete	ermined based
on the availability of enrolled students.	7 7/	
BI-CCN Compiler Construction This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle.	Z,ZK es of compilers for	5 students to
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching them	· ·	
BI-TEX TeX and Typography	Z,ZK	4
This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of	the course focuse	s on typographic
RUES.	7 71/	
BI-EHD Introduction to European Economic History This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
The state of the s		

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
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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-TI-VO.21

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

Requirement courses in the group:

Credits in the group: 0 Note on the group:

Note on the grou	·	1		1		
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-AWD.21	Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	٧
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	V
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	V
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko 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 Tísková Lenka Kosková Tísková (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	٧
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš 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-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	٧
BI-PGA.21	Programming of Graphic Applications Ji í Chludil, Radek Richtr Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	V
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	V
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	V

BI-SWI.21	Software Engineering Michal Valenta, Ji i Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	V
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	V
BI-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Ji í Mlejnek Ji í Mlejnek (Gar.)	KZ	5	2C	Z	V
BI-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-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	V
BI-TWA.21	Design of Web Applications David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-IDO.21	Introduction to DevOps Michal Valenta, Ji í Mlejnek, Tomáš Vondra, Zden k Rybola Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák 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 (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 Tvrdik Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal Ji í Novák Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	L	V
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan 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 Marian Svetlik, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	V

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

BI-SWI.21 Software Engineering

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

BI-ML1.21 Machine Learning 1 Z,ZK 5

The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working 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-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 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. 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. BI-AWD.21 Web and Database Server Administration Z,ZK 5 Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and backup complex database and web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server. Applied Network Security 5 The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks. BI-BEK.21 Secure Code Z,ZK 5 The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. DB Technologies for Big Data Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice. **Economic Business Processes** Z.ZK The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-EHA.21 **Ethical Hacking** 7.7K 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 The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-HWB.21 Hardware Security Z.ZK 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 Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KOM 21 Conceptual Modelling Z.ZK 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. ΚZ 3 BI-MDF.21 Modern Data Formats 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 5 Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for working with images, videos, 3D graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphic formats, and compression technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the principle of operation and use of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.

BI-PGR.21 Computer graphics programming	Z,ZK	5
After attending this curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design	the scene, add to	extures imitating
geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and	terms used in cor	nputer graphics,
such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe		
professional development, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and su	-	- 1
BI-PRS.21 Practical Statistics	KZ	5
		_
The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose is a student of the statistic of the stati	-	
will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	are K and will app	iy the studied
methods on data from real problems.		
BI-PNO.21 Practical Digital Design	KZ	5
Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand to	he basics of the V	HDL language
and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern	industry-standard	CAD design
tools.		
BI-PAI.21 Law and Informatics	ZK	5
The aim of the course is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge		-
	_	
Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding or		
environment, will know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able		
and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	-	
will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of	· · · · · · · · · · · · · · · · · · ·	oractice.
BI-PGA.21 Programming of Graphic Applications	Z,ZK	5
The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the	neir use for visualiz	ation of specific
data (3D scenes, mathematical 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 plugins.		
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 devel		
BI-PYT.21 Python Programming	KZ	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	ata processing. Th	e differences
between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the form	nat of a Jupyter no	tebook, 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 semest	er work will be as	signed during
the semester.		
BI-PRR.21 Project management	Z,ZK	5
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The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, are	-	-
project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk		-
Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for		
deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I	arge companies.	The course is
also suitable for all those who will develop software or hardware in the form of team projects.		
BI-SIP.21 Network Programming	Z	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level prog	ramming using BS	D sockets. The
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middle		
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in co	•	
programming language environment.	inputor labo dollig	, a chocon
	1/7	
BI-SP1.21 Team Software Project 1	KZ	5
Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		
concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project. The teams consisting of 4-6 students will work on a specific project.	acher, in the role o	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 fu	rther developed
and finished in the BIE-SP2 course.		
BI-SP2.21 Team Software Project 2	KZ	5
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the res		
However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will wo		
		people. The
teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their s		_
BI-SPS.21 Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administr	ated under the op	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	l by practical hand	s-on experience
with real network infrastructure.		
BI-ML2.21 Machine Learning 2	Z,ZK	5
The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in		
and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction met		
basic principles of reinforcement learning and natural language processing.	ious. Morcover, si	ducinio ger ine
	7.71	
BI-SVZ.21 Machine vision and image processing	Z,ZK	5
Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate	e image information	on. 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 sys	tems for solving
problems of practice that the graduates may encounter.		
BI-SRC.21 Real-time systems	Z,ZK	5
Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue		
lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab		-
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BI-TAB.21 Applications of Security in Technology	Z,ZK	5
The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stu	dents get a broad	er 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		
	Z,ZK	5
The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and	Z,ZK experience with lib	_
The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.		-
The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and 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 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 Z,ZK Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-TUR.21 User Interface Design Z.ZK 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-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-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. 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-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. BI-VPS.21 Selected Topics in Computer Networking Z.ZK 5 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-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). 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. BI-ZRS.21 **Basics of System Control** Z,ZK 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. Basics of System Security BI-ZSB.21 Z.ZK 5 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.

List of courses of this pass:

	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 t ate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by inc class of the term.	he midterm and the	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	e hierarchy of forma	al languages
	nderstand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity	1	
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
BI-ADU.21 Students will learn the in	Unix Administration ternal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. The	Z,ZK y will understand the	5 e differences
	nistrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, letwork services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known specific examples from practice.	=	-
BI-ADW.1	Windows Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-AG1.21	Algorithms and Graphs 1 e basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cu	Z,ZK	5 d partially
develops the knowledg	pe from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the ins. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics.	time and space co	
=	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 compulsor 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		Z,ZK	4
BI-ANG	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System	KZ ZK	
'	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate	KZ ZK	4
BI-ANG BI-ANG1 BI-ANGK	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN English Language Examination without Preparatory Courses English language, contact preparation for the B2 level exam	KZ ZK SG Z,ZK Z	2 2 2
BI-ANG1 BI-ANGK The content of the coursective part in the language.	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN English Language Examination without Preparatory Courses 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 to attempt and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by income	KZ ZK NG Z,ZK Z - students are due he midterm and the	4 2 2 2 to: -Take are in final term
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BI-ANG BI-ANGK The content of the course part in the langulatests with the success results. BI-APJ BI-APS.21	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN English Language Examination without Preparatory Courses 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 that est at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by includes of the term. Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java. Architectures of Computer Systems	KZ ZK NG Z,ZK Z students are due the midterm and the dividual teachers du Z,ZK Z,ZK Z,ZK	4 2 2 to: -Take are efinal term ring the firs
BI-ANG BI-ANGK The content of the cours active part in the langutests with the success results and the success results are s	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN English Language Examination without Preparatory Courses 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 the set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by includes of the term. Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java.	KZ ZK NG Z,ZK Z - students are due the midterm and the dividual teachers du Z,ZK Z,ZK Z,ZK cial emphasis is given beighes of instruction of the sequential more	4 2 2 2 to: -Take are a final term ring the first 4 5 ven on the a processing del of the
BI-ANG BI-ANGK The content of the cours active part in the languitests with the success rates and a success rates. BI-APJ BI-APS.21 Students will learn the pipelined instruction pronot only in scalar prooprogram. The course fur BI-ARD The subject is designed kits and control varied	The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System This course is presented in Czech. English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN English Language Examination without Preparatory Courses 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 to attem the set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by included the term. Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java. Architectures of Computer Systems of construction principles of internal architecture of computers with universal processors at the level of machine instructions. Specifications 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 other elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherents.	KZ ZK NG Z,ZK Z - students are due the midterm and the dividual teachers du Z,ZK Z,ZK Z,ZK Calal emphasis is given beingles of instruction of the sequential more rence and consister the systems, i.e. to see	2 2 2 to: -Take are a final term ring the firs 4 5 ven on the a processing del of the ency in such

	Algorithmanically	フフレ	1 4
BI-AVI.21	Algorithms visually ements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer scie	Z,ZK	4
-	ed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org<		-
nowicage present	that make understanding the principles of algorithms easy.	nttp://www.aigov	ision.orgagi,,
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
	cquainted 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 to the principles of the principles o		
BI-BAP.21	Bachelor Thesis	Z	14
BI-BEK.21	Secure Code	Z,ZK	5
The students will le	earn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting far		eat modeling
theory, students	s gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every p	orogram needs t	o run with
	rileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing d		
	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	defense agains	1
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		
	e students were able to choose suitable tools (mostly open source) and techniques,design and implement a simplest reproducible met mation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical		
conection, transion	of individual technologies will be supplemented with specific examples from practice.	i louridation and	presentation
BI-BLE	Blender	Z,ZK	4
	lads knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those intended for thos	•	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	Z	1
1. At the beginnir	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 semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the part of the semester.	artial tasks that I	ne / 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	e end of the sen	nester. 2. The
external supervisor	r enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.o	cz/student/studiji	ni/formulare).
	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		
has reserved is for	mulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assignment of the semester should be aimed primarily at fine-tuning the assignment.	nment so that the	e assignment
DI 0011	can be supplemented and approved at the end of the semester.	7 717	
BI-CCN	Compiler Construction	Z,ZK	5
	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of principles of programming languages. Society and actually understanding self-compiletion is the everywhere the	-	
	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching t		4
BI-CS1	Programming in C#	KZ	'1
The goal of the co	urse is to introduce. NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cor	etruction types	of variables
_	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental cor		
operators, array	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defin	ition and class i	nstancing,
operators, array		ition and class i	nstancing,
operators, array	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defination class to the control of th	ition and class i	nstancing,
operators, array constructors, meth	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging a	nition and class i and exception pro	nstancing, ocessing, as
operators, array constructors, methal BI-CS2 The C# language get to know object	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented programming in C# - class defined on the object oriented	KZ If platform. The sologies such as	nstancing, occessing, as 4 students will LINQ - a set
operators, array constructors, methal BI-CS2 The C# language get to know object of features for que	s, 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 Microsotts 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 (LIII)	ition and class i and exception provided KZ ft platform. The ablogies such as INQ to Objects, L	nstancing, occessing, as 4 students will LINQ - a set
operators, array constructors, methal BI-CS2 The C# language get to know object of features for que and LINQ to SQL	s, 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 Microsotts 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 (LII.). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data use	KZ ft platform. The sologies such as INQ to Objects, Ling domain-spec	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects
operators, array constructors, methal BI-CS2 The C# language get to know object of features for que and LINQ to SQL	s, 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 Microsofts 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 (LIII.). 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,	KZ ft platform. The sologies such as INQ to Objects, Ling domain-spec	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects
operators, array constructors, mether BI-CS2 The C# language get to know object of features for que and LINQ to SQL (ORM). This part of	s, 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 Microsofts 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 (LII). 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).	KZ ft platform. The cologies such as NQ to Objects, Ling domain-spec	nstancing, occessing, as 4 students will LINQ - a set LINQ to XML cific objects and Mapping
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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
•	overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on poss	•	
· ·	technology and on their solutions. The course will include the history of optical communications, an overview of passive components	• •	-
	sators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission syster topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as	•	
•	ncy transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters.		
	from practice.		
BI-ORL	Operations Research and Linear Programming	KZ	5
The subject aims to	introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundar	nental optimization	technique.
Operation	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	ad scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitionand implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W		ne to design
BI-PA1.21	Programming and Algorithmics 1	Z,ZK	7
I I	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, struc	, ,	
•	ons, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchi		
	with linked lists and trees.		
BI-PA2.21	Programming and Algorithmics 2	Z,ZK	7
	nstruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	_	
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 progr	ramming,
DI DALO4	copying/moving of objects, operator overloading, inheritance, polymorphism).	71/	_
BI-PAI.21	Law and Informatics urse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of	ZK	the Czech
	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		
and open-source lie	censes. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection a	against their misus	e. Students
will also be alert	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	of real cases from p	oractice.
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
	tent the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their		-
data (3D scenes, m	nathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using but by implementation of plugins.	uilt-in scripting lang	guages and
BI-PGR.21	Computer graphics programming	Z,ZK	5
II.	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		_
such as graphical p	ipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representing	ng solid fundament	tals for your
	oment, 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 F	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for this course in their 3rd semester of study.	OF BIE-TWA.T. THE	ey sriouid
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	isic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G	!	
	on 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		-
	only a programming language but any text in a language generated by a given LL input grammar.		
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	•	
recommended for st	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 the	is course in their 4	th semester
BI-PJS.21	of study. JavaScript Programming	KZ	5
	introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code develo		l
BI-PJV	Programming in Java	Z,ZK	4
Di i ov	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		-
BI-PKM	Introduction to mathematics	Z	4
	This course is presented in Czech.	, - '	-
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be wo	rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programm	ning, rule-based pr	ogramming,
	etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.		
BI-PNO.21	Practical Digital Design	KZ	5
	erview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the		
and implementation	on technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in tools.	dustry-standard C	AD design
BI-PPA.21	Programming Paradigms	Z,ZK	5
	ith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par		
	igm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. Th		
	s and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstr		
	such as C++ and Java.		I
BI-PRR.21	Project management	Z,ZK	5
	urse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, anal	-	
	ation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as ource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st		-
Janu Unario, 1880	ratos sonegais, resoutos palanonta, network graptis) and disalion of project abountification. The course is designed especially for sti	adding will alt ill	ULUSIEU III

deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large	ge companies. The	course is
BI-PRS.21 Practical Statistics	KZ	5
The students will be introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose mod	ı	_
will encompass regression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software	_	
methods on data from real problems.		
BI-PS2 Programming in shell 2	Z,ZK	4
Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition		
into shell and some other particular scripting languages and will get practical experience with shell script programming.	,, ga a acc	por moigni
BI-PSI.21 Computer Networks	Z,ZK	5
The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networking.	′	_
well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced networks.		
	•	Juuenis
practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux ar		
BI-PST.21 Probability and Statistics	Z,ZK	5
Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. The	=	
models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction t	=	-
estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical	hypotheses and d	etermining
the statistical dependence of two or more random variables.		
BI-PYT.21 Python Programming	KZ	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 d	ifferences
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 noteb	ook, 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		
the semester.		
BI-QAP Quantum algorithms and programming	KZ	5
Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or		_
are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm	•	•
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		
might be an advantage. No previous knowledge of physics is assumed.	and expendence w	iui i yuioii
	KZ	1
BI-QUA Quality Assurance	ı	. 4
This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of		
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should		
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 und	der test.
BI-SAP.21 Computer Structure and Architecture	Z,ZK	5
Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithr	netic-logic unit, co	ontrollers,
nemory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proces		
in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.		
BI-SCE1 Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	_	
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		
articles and other professional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers	•	
semester.	s. The topics are in	ew ioi eacii
	7	4
BI-SCE2 Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to		
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	•	
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	s. The topics are n	ew for each
semester.	ľ	
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 co	mparing individua	l 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	ndexes of econom	ic freedom,
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of dis	scussions based o	n individual
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SIP.21 Network Programming	Z	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level program	ı ming using BSD so	
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middlewa		
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in con	-	-
programming language environment.		
BI-SKJ.21 Scripting Languages	Z,ZK	4
Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition		-
into shell and some other particular scripting languages and will get practical experience with shell script programming.	iii, tiley gaili a dee	per maigni
		1
BI-SOJ Machine Oriented Languages	7.71/	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use	Z,ZK	
and officient appropriate of poftware with hardware. Next, there will be discussed via an addition of the analysis of One form the analysis.	e of microprocesso	
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 lin	e of microprocesso	
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	e of microprocesso ked to higher level	languages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1	e of microprocesso ked to higher level	languages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	e of microprocesso ked to higher level	languages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher	e of microprocesso ked to higher level KZ BIE-SWI course t er, in the role of the	5 hat runs e team and
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	e of microprocesso ked to higher level KZ BIE-SWI course t er, in the role of the	5 hat runs e team and
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher	e of microprocesso ked to higher level KZ BIE-SWI course t er, in the role of the	5 hat runs e team and
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software arter	e of microprocesso ked to higher level KZ BIE-SWI course t er, in the role of the	5 hat runs e team and
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software and finished in the BIE-SP2 course.	e of microprocesson ked to higher level KZ BIE-SWI course ter, in the role of the fact will be further	5 hat runs e team and developed
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2	KZ BIE-SWI course ter, in the role of the state will be further	5 hat runs e team and developed 5 urse project.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the support of the software project.	KZ BIE-SWI course ter, in the role of the state will be further KZ of the BIE-SP1 course ter, in teams of 4-6 per interest.	5 hat runs e team and developed 5 urse project.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the software, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work	KZ BIE-SWI course ter, in the role of the state will be further KZ of the BIE-SP1 course ter, in teams of 4-6 per interest.	5 hat runs e team and developed 5 urse project.

BI-SPS.21	Administration of Computer Networks and Services	Z,ZK	5
	rse is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrate		_
	s. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by		
	with real network infrastructure.		
BI-SQL.1	Language SQL, advanced	KZ	4
	n knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa	1	gram unites,
	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point		-
	exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan ar	-	
will be discusse	ed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora	acle DBMS and pa	rtially on
	PostgreSQL.		
BI-SRC.21	Real-time systems	Z,ZK	5
Students obtain t	he basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues	. Theoretical know	edge from
lectures will be ex	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 th	e BIE-VES
	course.		
BI-ST1	Network Technology 1	Z	3
The subject is o	riented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited	d under the Cisco	Netacad -
	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
Students will further	er enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during E	BI-ST1 and BI-ST2	courses will
get further exten	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, prediction of the course.	ictability, extension	beyond a
	simple topology, security, etc.		
BI-ST4	Network Technology 4	Z	3
	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	-	
	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici		
	e topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely		
· ·	le Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch		-
recoveries, and er	nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation network running.	on ways while mair	itaining the
BI-STO		7 71/	4
	Storage and Filesystems	Z,ZK	4
The student will lea	arn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi load balancing and high availability.	iviliy, as so as sioi	age scaling,
BI-SVZ.21		Z,ZK	5
	Machine vision and image processing are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in	'	_
-	s to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use	_	
miroddood diddoni	problems of practice that the graduates may encounter.	or camora cyclom	o loi colvillig
BI-SWI.21	Software Engineering	Z,ZK	5
	ainted 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-	•	
using the visual la	nguage UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design a	and testing. Within	the course,
st	udents also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their	development.	
BI-TAB.21	Applications of Security in Technology	Z,ZK	5
The goal of the co	ourse is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stude	nts get a broader	overview of
	cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware	security.	
BI-TDA	Test driven architecture	KZ	4
The course is for	cused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that ar	re well known in the	e DevOps
world. This co	ourse has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occu	r in the semester p	roject.
BI-TDP.21	Documentation and Presentation	KZ	3
The course is focu	sed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fi	nal university these	es. Students
	of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese		
the teacher. The	course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14	days of teaching.	Within the
	exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.		
BI-TEX	TeX and Typography	Z,ZK	4
This course is pres	sented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	course focuses on	typographic
DI TIO 04	rules.	7.71	
BI-TIS.21	Information Systems	Z,ZK	5
_	purse is to familiarise students with the information systems topic and information systems implementation principles. During the course is to familiarise students with the information systems topic and information systems implementation principles. During the course is to familiarise students with the information systems topic and information systems implementation principles. During the course is to familiarise students with the information systems topic and information systems implementation principles. During the course is to familiarise students with the information systems topic and information systems implementation principles.		
	xisting types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other		-
	ital part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa Id information system implementation based on the project management principles. The emphasis is on the initial customer analysis,	=	-
	is better to implement any existing information system or to develop a new one from scratch. These factors determine the information sy		
	of the course information systems security, operation, support, maintenance, legislation impacts, and government information system	· ·	
BI-TJV.21	Java Technology	Z,ZK	5
	ide knowledge and skills for developing information systems and applications through concepts used in software development and exp		_
3::- : :=	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
	uces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physica	,	
	ures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies	=	-
with the most impo	ortant ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethern	et, modern wireles	s networks,
	always with focus on high-speed networks.		

BI-TS1 Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS2 Theoretical Seminar II 7 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. User Interface Design Z,ZK Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BI-TWA.21 Design of Web Applications The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React. Technological Fundamentals of Computers BI-TZP.21 Z,ZK Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-UKB.21 Introduction to Cybersecurity Z,ZK 5 The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations. BI-ULI 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) BI-UOS.21 Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell. Selected Applications of Combinatorics The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BI-VDC.21 Virtualization and Data Centers 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-VFS 21 **Embedded Systems** Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. **BI-VHS** Virtual game worlds The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices 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. BI-VMM Selected Mathematical Methods Z,ZK The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and their properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples. BI-VPS.21 Selected Topics in Computer Networking The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technologies used in modern computer networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real network devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and security.

BI-VR1 Virtual reality I ΚZ 4 Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared social activities. BI-VR2 ΚZ Virtual reality II 3 Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The objective is to develop applications for computer science and gamification in various social metaverse and desktop engines. BI-VWM.21 Searching the Web and Multimedia Databases Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). **BI-ZIVS** Intelligent Embedded System Fundamentals ΚZ Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. **BI-ZNF** ΚZ 3 PHP Framework Nette - basics Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. Process engineering ΚZ Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. BI-ZRS.21 Basics of System Control The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. BI-ZS10 Bachelor internship abroad for 10 credits Ζ 10 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Ζ Bachelor internship abroad for 20 credits 20 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-7S30 Bachelor internship abroad for 30 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZSB.21 Basics of System Security The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis. Z,ZK BI-ZUM.21 Artificial Intelligence Fundamentals Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course. BI-ZWU Introduction to Web and User Interfaces Z,ZK 4 This course is presented in Czech. **BIE-CSI** Introduction to Computer Science Ζ 2 This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fields but interested in computer science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The goal of the class is to introduce and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level programming languages and tools are done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected, or even less than before. **RIF-DIF** Differential equations 7.7K 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	l equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.	and PDEs, includi	ng implicit
BIE-EEC The BIE-ECC cour	English language external certificate se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Englis the B2 level of the Common European Framework of Reference for Languages.	Z sh comparable to o	4 r exceeding
BIE-IMA2 Students refresh a	Introduction to Mathematics 2 Ind extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a examples.	Z ble to apply them i	2 n particular
to understand prod	Systems Engineering tory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of occessor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what con	he class, students	are able to
BIE-ZUM	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. Artificial Intelligence Fundamentals	Z.ZK	4
Students are introd	duced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical	al tasks from the ar	eas of state
space search, mul	ti-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms be presented as well.	s and the neural ne	etworks, will
FI-TOP	Academic writing portant and required part of research activity. It is not only about obtaining research results but also about applying them in the form o	Z of publication, Writing	2
_	e 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 cour	•	-
	ticle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an a		ū
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. Da on the availability of enrolled students.	tes will be determi	ned based
NI-AFP	Applied Functional Programming	KZ	5
· ·	sented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional pr s and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, masteri		-
	necessary competence of a software engineer: the theory and especially the practice.		
NI-DDM	Distributed Data Mining	KZ	4
	n state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands o amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations at approaches to parallelize other algorithms. The course is prezented in czech language.	· ·	_
NI-DSP	Database Systems in Practes This course is presented in Czech.	Z,ZK	4
NI-DZO	Digital Image Processing	Z,ZK	4
· ·	ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algove an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als		-
	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR		
interactive as-ri	, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray convigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ad	lding depth, alpha	matting.
NI-IAM The NI-IAM cour	Internet and Multimedia se is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acqu	Z,ZK uisition of AV signa	4 als (input).
presentation of AV	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical uniterfaces.	se case scenarios	of real-time
	missions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effectory of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the for audience.	-	
NI-LSM	Statistical Modelling Lab	KZ	5
	ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p ion and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		
avaliable illioittiati	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	=	properties.
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
	ogramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where i	ts ability to natural	
	nplex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills	•	lenientation
	nplex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development no	of design and imp eeds and areas of	interest. In
addition to deepen	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development neing object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work o	of design and imp eeds and areas of n interesting proje	interest. In cts and OO
addition to deepen	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development ne	of design and imp eeds and areas of n interesting proje	interest. In cts and OO
addition to deepen technologies in te NI-MPL NI-MSI	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not not object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science	of design and impleeds and areas of n interesting projecent in the Pharo CZKZ,ZK	interest. In cts and OO consortium.
addition to deepen technologies in te NI-MPL NI-MSI	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not not object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science emantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	of design and impleeds and areas of n interesting projecent in the Pharo CZKZ,ZK	interest. In cts and OO consortium.
addition to deepen technologies in te NI-MPL NI-MSI	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not not object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science	of design and impleeds and areas of n interesting projecent in the Pharo CZKZ,ZK	interest. In cts and OO consortium.
addition to deepen technologies in tel NI-MPL NI-MSI Mathematical so NI-OLI The Linux operation	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not not object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science emantics of programming languages. Data types as continuous lattices, Scott topology. Procedures as continuous mappings. The Scott Introduction to category theory. Linux Drivers g system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining por	of design and impleeds and areas of an interesting project in the Pharo CZKZZK model of lambda ZZK	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs
addition to deepen technologies in termologies in termologies. NI-MPL NI-MSI Mathematical services NI-OLI The Linux operation increase the var	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not not object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work or the organization of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science emantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott Introduction to category theory. Linux Drivers	of design and impleeds and areas of an interesting project in the Pharo CZKZ,ZK model of lambda a Z,ZK werful processors at for master's studiends and areas of the studies	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs
addition to deepen technologies in termologies in termologies. NI-MPL NI-MSI Mathematical so NI-OLI The Linux operatin increase the var	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not also object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology	of design and impleeds and areas of an interesting project in the Pharo CZKZZK model of lambda ZZZK werful processors at for master's studial experience.	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs ents. The
addition to deepen technologies in termologies in t	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not also object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of the students with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science The semantics of programming languages. Data types as continuous lattices, Scott topology. Procedures as continuous mappings. The Scott Introduction to category theory. Linux Drivers g system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining positive of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development ourse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical data for further processing and analysis. They learn what algorithms can be used to extract information from various data so and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characterists.	of design and impleeds and areas of an interesting project in the Pharo CZKZZK model of lambda and czyzK werful processors at for master's studial experience. Z,ZK ources, such as impleeds and areas impleeds and areas in the control of the contr	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs ents. The 5 ages, texts,
addition to deepen technologies in termologies in t	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not also object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of the students with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology Mathematical Structures in Computer Science emantics of programming languages. Data types as continuous lattices, Scott topology. Procedures as continuous mappings. The Scott Introduction to category theory. Linux Drivers g system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining positibility of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development ourse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical data for further processing and analysis. They learn what algorithms can be used to extract information from various data so	of design and impleeds and areas of an interesting project in the Pharo CZKZZK model of lambda and czyzK werful processors at for master's studial experience. Z,ZK ources, such as impleeds and areas impleeds and areas in the control of the contr	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs ents. The 5 ages, texts,
addition to deepen technologies in term NI-MPL NI-MSI Mathematical so NI-OLI The Linux operating increase the var con NI-PDD Students learn to put time series, etc., in NI-PSD The course will into the technologies.	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development not also object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work orms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem Managerial Psychology	of design and impleeds and areas of an interesting project in the Pharo CZKZ,ZK model of lambda Z,ZK werful processors at for master's studial experience. Z,ZK ources, such as imics from images of KZ occess from the pe	interest. In cts and OO consortium. 2 4 calculus. 4 and FPGAs ents. The 5 ages, texts, from web 4 rspective of

NI-PSL	Programming in Scala	Z,ZK	4
The course introd	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featur	es - e.g.pattern ma	tching and
advance standard I	ibrary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and	l libraries e.g. Play,	Cassandra,
	Scalaz, etc.		
NI-REV	Reverse Engineering	Z,ZK	5
Students will get ad	quainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens bef	ore and after the m	nain function
	will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated and how they interact with 3rd party libraries.		
	ten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be d	•	•
debuggers and de	bugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer	malware scene. T	he focus of
	the course is on the seminars, where students will solve practically oriented tasks from the real world.		
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds	upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	arious variants and	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
_	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre		
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	oment. They
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.	<u> </u>	ı
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
_	n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	•	
	rtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie		•
	rameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	٠,	•
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).	7 71/	
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.	_	
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVK1	Physical Education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2025-04-05, time 21:57.