Study plan

Name of study plan: Bachelor Specialization Computer Science, in Czech, 20214

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

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

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

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

akademického roku 2024/2025 do prezen ní formy studia bakalá ského programu. . Garant: doc. lng. 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. Otherwise, enroll in the course BI-PSI.21 in your 3rd 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 Tomáš Valla, Michal Opler, Dušan Knop, Ond ej Suchý, Ond ej Šofr, Radek Hušek, Jan Volec 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	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 Ji í Hunka	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Daniel Dombek, Jan Sp vák, Jan Legerský Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Robert Lorencz	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 Tomáš Kalvoda	Z,ZK	5	2P+1R+1C	L	PP
BI-MA2.21	Mathematical Analysis 2 Pavel Hrabák, Tomáš Kalvoda, Eva Pernecká, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP

BI-OSY.21	Operating Systems Pavel Tvrdík	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI.21	Computer Networks Jan Fesl	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 Jan Trávní ek	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP.21	Computer Structure and Architecture Hana Kubátová	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 Dana Vynikarová, Tomáš Nová ek Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BI-UOS.21	Unix-like Operating Systems Viktor erný, Michal Hažlinský, Jakub Jan i ka, Miroslav Prágl, Michal Šoch, Jan Trdli ka, Yelena Trofimova, Petr Zemánek, Jakub Žitný, 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

Z,ZK

5

Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions, and regular grammars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages and they understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes P and NP.

BI-BAP.21	Bachelor Thesis	Z	14
BI-BPR.21	Bachelor project	Z	1

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

5

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

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

Z,ZK

5

We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms.

BI-MA2.21 Mathematical Analysis 2

Z,ZK

6

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.

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

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

The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically final university theses. Students learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present it in front of classmates and the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.

Unix-like Operating Systems

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

Name of the block: Compulsory courses in the specialization

Minimal number of credits of the block: 40

The role of the block: PS

Code of the group: BI-PS-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 Ond ej Suchý	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 Lud k Kleprlík	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 K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5	2P+1C	L	PS

BI-PPA.21	Programming Paradigms Jan Janoušek, Jan Liam Verter, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	PS
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek	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

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 delives 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** Z,ZK

5

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

BI-LA2.21 Linear Algebra 2 Z,ZK

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

BI-LOG.21 Mathematical Logic Z,ZK

The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained.

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

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** 7.7K

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.

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.

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Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-SWI.21	Software Engineering Zden k Rybola	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

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

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

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

Minimal number of credits of the block: 0

demonstrations, pandas and scikit libraries in Python will be used.

The role of the block: PT

Code of the group: BI-PT.24

Name of the group: Physical Education, version 2024

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

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

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

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group:

BI-ANG, ending with an exam for two credits, is enrolled by students who have completed preparator English courses and have a credit from the BI-A2L course.
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 BI-ANG1, ending with an exam for two credits, is enrolled by students who prepared for the exam independently and do not have credit from BI-A2L. These students must complete a credit paper before their own exam. After passing the exam, the student will also --
br> 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	The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding							
the B2 level of the Com	mon European Framework of Reference for Languages.							
BI-ANG	BI-ANG English Language, Internal Certificate ZK 2							
Course information and	Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG							

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

The role of the block: V

Code of the group: BI-V.2021

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

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	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era	Z,ZK	4	2P+1C	L	V
BI-A2L	English language, preparation for the B2 level exam Kate ina Valentová	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Robert Pergl	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	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes	Z,ZK	4	2P+1C	L	V
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
BI-DAS	Data Structures Michal Opler, Radek Hušek Michal Opler Michal Opler (Gar.)	Z,ZK	5	2P+1C	L	V
NI-PSD	Public Services Design David Pešek	KZ	4	1P+2C		V
BIE-DIF	Differential equations Tomáš Kalvoda	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 Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er	KZ	4	2P+2C	L	V
BI-ANGK	English language, contact preparation for the B2 level exam Kate ina Valentová (Gar.)	Z	2	2C	Z,L	V
BI-EJA	Enterprise Java	Z,ZK	4	2P+2C	L	V
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4	2P+2C	L	V

BI-FMU	Financial and Management Accounting	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Robert Hülle	KZ	4	3C	L	V
NI-IAM	Internet and Multimedia Ji i Melnikov	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BI-CS2	C# language and data access Pavel St pán Pavel St pán Pavel St pán (Gar.)	KZ	4	0P+3C	Z	V
BI-CS3	Language C# - design of web applications Pavel St pán	KZ	4	3C	Z	V
BI-SQL.1	Language SQL, advanced Michal Valenta	KZ	4	3C	L	V
BI-QAP	Quantum algorithms and programming Tomáš Kalvoda, Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	V
NI-LSM	Statistical Modelling Lab Kamil Dedecius	KZ	5	3C	L	V
BI-HAS	Human Aspects in Cryptography and Security 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 Stary	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 (Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Operations Research and Linear Programming Dušan Knop	KZ	5	1P+2C	L	V
NI-OLI	Linux Drivers Jaroslav Borecký	Z,ZK	4	2P+2C	L	V
BI-ACM	Programming Practices 1 Tomáš Valla	KZ	5	4C	L	V
FIT-ACM1	Programming Practices 1 Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
FIT-ACM2	Programming Practices 2 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-ACM2	Programming Practices 2 Tomáš Valla	KZ	5	4C	Z	V
FIT-ACM3	Programming Practices 3 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
BI-ACM3	Programming Practices 3 Tomáš Valla	KZ	5	4C	L	V
FIT-ACM4	Programming Practices 4 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-ACM4	Programming Practices 4 Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
FIT-ACM5	Programming Practices 5 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
FIT-ACM6	Programming Practices 6 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
BI-AND.21	Programming for the Android Operating System	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 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	Z,ZK	4	2P+2C	L	V

NI-PSL	Programming in Scala	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Zden k Buk Zden k Buk Zden k Buk (Gar.) Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2	Z,ZK	4	2P+2C		V
	Lukáš Ba inka Data Preprocessing	-	-	_		
NI-PDD	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 Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II Hana Kubátová	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2 Alexandru Moucha Alexandru Moucha Alexandru Moucha	Z	3	3C	L	V
BI-ST3	Network Technology 3	Z	3	2C	Z	V
BI-ST4	Alexandru Moucha Álexandru Moucha (Gar.) Network Technology 4	Z	3	2C	1	V
	Alexandru Moucha		3		L	V
BI-SKJ.21	Scripting Languages Lukáš Ba inka	Z,ZK	4	2+2	L	V
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
FIT-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers Jan Janoušek 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 Tomáš Valla, Michal Opler, Dušan Knop, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Tomáš Valla	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Tomás Valla	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	KZ	4	3C	Z	V
FIT-TOP	Martin Pilný, Kate ina Kalášková Kate ina Kalášková Martin Pilný (Gar.) Academic writing	Z	2	10B	Z	V
BI-CCN	Petr Kroha, Tomáš Nová ek Tomáš Nová ek Petr Kroha (Gar.) Compiler Construction	Z,ZK	5	2P+1C	L	V
BI-TEX	Christoph Kirsch TeX and Typography	Z,ZK	4	2P+1C		V
BI-EHD	Petr Olšák Introduction to European Economic History	Z,ZK	3	2P+1C		V
	Tomáš Evan Tomáš Evan Tomáš Evan (Gar.) Cultural and Social Anthropology	·				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
BI-KSA	Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V

Z,ZK Z,ZK	4 5	2P+1C	Z	V
Z,ZK	5			V
	5	2P+1C	L	V
ZK	4	2P+2C	Z	V
KZ	4	2P+2C	L,Z	V
KZ	3	1P+2C	L	V
Z	3	2R	L	V
Z,ZK	4	2P+2C	L	V
Z,ZK	4	2P+2C	L	V
Z	10		Z,L	V
Z	20		Z,L	V
Z	30		Z,L	V
KZ	4	1P+3C	Z	V
KZ	4	1P+2C	L	V
KZ	3	2P+1C	L	V
nne KZ	4	2C	Z	V
Z,ZK	4	2P+2C	L	V
KZ	4	3C	L	V
	KZ Z Z,ZK Z,ZK Z Z Z Z KZ K	KZ 3	KZ 4 2P+2C KZ 3 1P+2C Z 3 2R Z,ZK 4 2P+2C Z,ZK 4 2P+2C Z 10 2 Z 30 2 KZ 4 1P+3C KZ 4 1P+2C KZ 3 2P+1C Inc. KZ 4 2P+2C	KZ 4 2P+2C L,Z KZ 3 1P+2C L Z 3 2R L Z,ZK 4 2P+2C L Z,ZK 4 2P+2C L Z 10 Z,L Z 20 Z,L Z 30 Z,L KZ 4 1P+3C Z KZ 4 1P+2C L Me KZ 3 2P+1C L Me KZ 4 2C Z Z,ZK 4 2P+2C L

IV1	Physical Education		0
TVV	Physical education	Z	0
TVK1	Physical Education	Z	1
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKZV	Physical Education Course	Z	0
TVKLV	Physical Education Course	Z	0
BI-ADW.1	Windows Administration	Z,ZK	4
This course is pres	sented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-ALO	Algebra and Logic	Z,ZK	4
The course extend	ls and deepens the study of topics touched upon in the basic course in logic.		
BI-AVI.21	Algorithms visually	Z,ZK	4
The source comple	manta athar algorithm accurage at EIT It brings I reculades about particular important algorithms from different fields of the com-	nutar asianaa that aut	برالمناهمهم ماريم لممم

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 Ζ 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 Z,ZK Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java. Applied Functional Programming ΚZ

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.

Artificial Intelligence Fundamentals

Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.

BI-BLE Blender Z,ZK

The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in 3D graphics and animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course.

NI-DSP	Database Systems in Practes	Z,ZK	4
This course is present			4
BI-STO	Storage and Filesystems	Z,ZK	4
The student will learn place load balancing and high	principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and the availability.	archiving, as so as	storage scaling,
BI-DAS	Data Structures	Z,ZK	5
	more advanced data structures, including analysis of their complexity.		
NI-PSD	Public Services Design restricted by the students to specific of UX, Service design and development for public sector. We will look into the design and development for public sector.	KZ	4
	isignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collabora	•	
	dents-designers as well as clients.		
BIE-DIF	Differential equations foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essent	Z,ZK	5
	ems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered		•
_ ·	illowed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications.		
l ·	ations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD nods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.	Es and PDEs, incl	uding implicit
NI-DZO	Digital Image Processing	Z,ZK	4
	a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical		-
I	n interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that		
1	sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HD straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray	-	- 1
' '	possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a		
NI-DDM	Distributed Data Mining	KZ	4
	te-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain har		- 1
1 -	work Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementatio ize other algorithms. The course is prezented in czech language.	ns and will be capa	able to propose
BI-EP1.24	Effective programming 1	KZ	4
The course is taught in		'	
BI-EP2	Efficient Programming 2	KZ	4
	nt Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving in the best one and avoid implementation errors.	dividual problems a	are discussed,
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
	rse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievem	ent - students are	due to: -Take an
	lage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in bot		
class of the term.	rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	s during the first
BI-EJA	Enterprise Java	Z,ZK	4
	nced technologies in the Java programming language. The focus is on technologies for development of enterprise information	systems which ar	e connected to
a database and are ac	cessed through the web interface.	Z,ZK	4
	Enterprise Java and Kotlin nced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise info	1 ' 1	•
	be deployed to the cloud.		
BI-FMU	Financial and Management Accounting	Z,ZK	5
	is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modific	•	
· ·	s based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of mana	•	
Business Inteligence n	noduls 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. Indatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as	=	-
	s of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network		
·	eir practical abilities in this field.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is present	Interactive applications on Arduino	KZ	4
	for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple app	1 1	
kits and control varied	peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded	d systems, i.e. to s	ee the results
1	a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefo	re is suitable even	for Web and
Software Engineering	Internet and Multimedia	Z,ZK	4
	ocused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes a	1 ' 1	
·	nals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at pract		
	ons. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the control of the con		-
for audience.	OF AV ITALISHISSIONS. Students will learn now to build internet infrastructure for end-to-end AV Italishissions from the recording	ig the scene up to	ine presentation
BIE-CSI	Introduction to Computer Science	Z	2
_ ·	class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in oth		
_	tudents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	-	
	oles of computer science for students to understand, early on, what computer science is, why things such as high-level progr , and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answe		
1	stions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are in	•	.
than expected, or ever	less than before.		

FILE-LEM Introduction to European Economic History and a Servant Servant in the Program of the property of the property of the program of the property of the property of the program of the property of the			_
all the buy persons in history. As Employment out the falled Age, from better design and National Employment of Important Parts of History of particular incomposition. The control of the control of the Control of Particular Incomposition	FITE-EHD Introduction to European Economic History	Z,ZK	3
are of Roman Empleo to Signamentation of the Model Analysis (from destroutco of Wilfling to the courter aftering the destroutch listed by profitable Conception controlled and raised on dark and departications in history Globs modeling will device of a motion of advance and descriptions. In Introduction to Mathematical St. Z. 2 2 2 Substant selected and extension of advance and descriptions. Electrous Controlled and the selected translation of advance and descriptions. Electrous Controlled and the selected translation of advance and descriptions. Electrous Controlled and the selected translations of advance and descriptions. Electrous Controlled and the selected translations of the selected translations and the selected translations. Electrous Controlled and the selected translations and the selected translations. In the selected translations are selected translations. Electrophysics of the selected translations and the selected translations. Electrophysics of the selected translations and the selected translations. Electrophysics of the selected translations and the selected translations. Electrophysics of the selected t			-
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mentings all connected of ministrane of shouthward on discussions. BER-IMAN 2 Introductions to Mathematicals or 2 historians and their progression. Students understand basic insufferministical principles and though well with a control insufficient and data accounts of the control of the co			
BIE-MA2 Introduction to Mathematics 2 2 2 2 2 2 2 2 2 2		a organizationo in	motory. Oldoo
Blueders infereb and extends towerday of elementary functions and their properties. Students understand basic markematical principles and they are able to apply finem in particular servering. Blueder SC		7	2
Searchises BL-CS2 CP language and data access The CP language and data access course objective is to includes suderin several data access technologies - database. MIL, NSSC - on the Microsophistory. The students will be a conscious deviced for refere data - connection, Command, Data Reade and Data-dapter + ADDIET Net, they will learn to use current technologies acute and the control of the c		1 1	
BLCS2 Cell fainguage and data access The Cell Fraigness of data access common depth access to the data access common depth access to relative data a		are able to apply an	ioni in particular
The CA Impagings and data access course elegative is to introduce students several data access to testine data. Commedia, Commedia, Data Render and Distardagtive v XO. DATA tool, they will be used to estine data to a contract the contract for carrying and updating data, integrated directly with the NFT platform languages, which enables LINQ use with Capitate, XML and SDL (LINQ to Objects, LINQ a set of features for quarrying and updating data, integrated directly with the NFT platform languages, which enables LINQ use with Capitate, XML and SDL (LINQ to Objects, LINQ a set of features for quarrying and updating data, integrated directly with the NFT platform languages with enables LINQ use with Capitate, XML and SDL (LINQ to Objects, LINQ a set of the NFT platform languages) and the platform of the NFT platform languages and the NFT platform languages and the NFT platform languages and the NFT platform of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire a comprehensive overview of the development of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They will acquire the network of the NFT platform. They	·	K7	4
get to hance dispets used to estitive data—Commercian, Command, Data Reader and Dispets (price). Not, they will learn to use current schmologies such as LINPO - a set of setures for quarying and updating data, integrated delicity by the NET patient majority. All control of SQLL, Another objective is the Entity Framework: an object-relational majority than the Commercian of the Commercian	1 9 - 9	1 1	ne students will
of teatures for querying and updating data, integrated affectly with the NET pattorn tanguage, which enable LING use with Objects. XML and SCI, LING to Objects. LING to Objects			
(DRM). This part of the course introduced Code Field Dalabase First, Model First approaches. The students will also get to know the Conceptual Model, Scorge Model and Mapping (DRM). Secretary of the Code of the	of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQI	L (LINQ to Objects	s, LINQ to XML
South description)	and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data	a using domain-sp	ecific objects
BI-CS3 Language Cr - design of web applications the students with the remotizent or comment entemologies in well explaination development on the NET platform. They will acquire a comprehensive overlevel of the development possibilities on this platform. They will earn to create VebAPI and to use it by client programs. BI-SQL: 1 Language SQL advanced Module is based on knowledge obtained in Bi-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In particular students of program unified to the program of the students of t	(ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mo	odel, Storage Mod	el and Mapping
The students will be introduced to current technologies in web application development on the NET platform. They will acquire a correpetherselve coveries of the development possibilities on inheplations. They will learn to create whether and in seas they tiden programs. BI-SQL.1 Language SQL, advanced Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language, in particular strong program unities, triggers, scrutisive queries, QLAP support, object-relational constructions. Part of the course is sodicated to practical distables experience control in the point of view of a specialized. Recording his program is programs will be discussed. Lectures will excluse SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS and puriodly in Paragraphs and the programming of the course is a start principal scale on a programming and programming. We locus on fundaments of quantum mechanics will be discussed. Lectures will be discussed that the programming and the programming and programming and programming. We locus on fundaments of quantum mechanics and programming and programming and programming and programming. We locus on fundaments of quantum mechanics and programming and programming and programming and programming and programming and programming and programming. We locus on fundaments of quantum mechanics and programming and	(XML description).		
on the plateform. They will learn to create WebAPI and to use it by dient programs. If SOL 1. Language Do, advanced Module is based on toolwiedge obtained in B-DBS Students become familiar with advanced relational and non-relational features of SOL tanguage. In particular stored program unified, respectively. The plate of the p	BI-CS3 Language C# - design of web applications	KZ	4
BI-SQL 1 Language SQL advanced Module is based on the IDRS Students become familiar with advanced relational and non-relational features of SQL language. In particular strong program writes, triggers, coursew queries, OLPA support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of view of a specialized database structures like indicased, cultares, index-organized tables, and materialized views as well as from the point of view query optimization. Execution plant particular view of a specialized distances in the particular view of the possibilized of its chief particular view of the view of the particular view of the view of the particular view of the vie	The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overvi	ew of the developr	nent possibilities
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FIT-ACM4 Programming Practices 4	KZ	5
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FIT-ACM5 Programming Practices 5 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
FIT-ACM6 Programming Practices 6	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	I\Z	3
BI-AND.21 Programming for the Android Operating System	KZ	4
This course is presented in Czech.	'	
BI-CS1 Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental		
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class deficient constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggir		-
well as work with files are emphasized.	e and chochilon	processing, as
BI-PJV Programming in Java	Z,ZK	4
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	<u> </u>	·
BI-PJS.1 JavaScript Programming	KZ	4
Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development	•	
recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for	this course in th	eir 4th semester
of study. BI-KOT Programing in Kotlin	Z.ZK	4
Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adva	,	· -
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		
with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
NI-PSL Programming in Scala	Z,ZK	4
The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature and the second of the seco		_
advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a Scalaz, etc.	na libraries e.g. i	Play, Cassandra,
BI-PMA Programming in Mathematica	Z.ZK	4
Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional program	,	•
etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.		
BI-PHP.1 Programing in PHP	KZ	4
The course is taught in Czech. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a		
development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for register for this course in their 3rd semester of study.	or Bie-TWA.T. II	ney snould
register for all of dealer in all and demoster of stady.	Z,ZK	4
BI-PS2 Programming in shell 2		
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his course is present	Network Technology 2	Z	3
		7	
II-ST3 tudents will further e	Network Technology 3 The name of their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during the courses.	Z	ST2 courses v
	n the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pre-	-	
mple topology, secui		,,,	
I-ST4	Network Technology 4	Z	3
udents will further e	nhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switch	ning presented dur	ing BI-ST1 and
-ST2 courses got fu	rther extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased ef	fficiency, predictab	ility, extension
	ogy, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete		•
•	cess) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and swi		•
coveries, and emerg twork running.	pency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitig	gation ways while	maintaining th
-SKJ.21	Scripting Languages	Z,ZK	4
	ு Scripting Languages al overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ac	1	
	her particular scripting languages and will get practical experience with shell script programming.	adinon, and, gain o	. чеоро:о.д.
-SOJ	Machine Oriented Languages	Z,ZK	4
	will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optim		ı cessor's featuı
d efficient cooperati	on of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of vie	ew linked to higher	level languag
is knowledge will be	e used during reverse engineering, optimization, and evaluation of code security.		
IT-SEP	World Economy and Business	Z,ZK	4
	ed in Czech. The course introduces students of technical university to the international business. It does that predominantly be		
	Id economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as we		
-	nic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	of discussions bas	sea on inaiviai
	to take bachelor level of this course BIE-SEP as a prerequisite.	7.71/	
-SEP	World Economy and Business ed in Czech. The course introduces students of technical university to the international business. It does that predominantly b	Z,ZK	4
=	ld economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as we		
	nic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form		
	to take bachelor level of this course BIE-SEP as a prerequisite.	0. 0.00000.0.00	
-SYP	Parsing and Compilers	Z,ZK	5
	in the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge	1	_
LR parsing and are	introduced to special applications of parsers, such as incremental and parallel parsing.		
l-GIT	Version control system GIT	KZ	2
udents will be introd	uced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and p	ractically. In this pa	articular syste
en the implementati	on details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve	er administrators.	
IE-SEG	Systems Engineering	Z	0
-	class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles		l .
understand process			
	or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After take	king the class, stud	dents are able
derstand the differe	or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After takence between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co	king the class, stud	dents are able
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derstand the differe rallelism, and how p	sor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what corocesses and threads synchronize efficiently to overcome concurrency for communication. Physical Education 2	king the class, stud concurrency is, as c	dents are able opposed to
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· ·	Academic writing	Z	2
	t and required part of research activity. It is not only about obtaining research results but also about applying them in the for I for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the c	-	-
•	hat parts such an article should have, and how the peer review process works. Students will also try their hand at presenting		
	will be taught in blocks, with theoretical part at the beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester/beginning of the semester and one practical at the end of the semester and one practical at the end of the semester and one practical at the end of the semester and one practical at the end of the semester and one practical at the end of the semester at the semester		- 1
will be determined based	on the availability of enrolled students.		
BI-CCN (Compiler Construction	Z,ZK	5
	ass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	=	students to
	d implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme		
· ·	TeX and Typography	Z,ZK	. 4
rules.	in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	ne course focuses	s on typograpnic
	ntroduction to European Economic History	Z,ZK	3
	in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	۷,۷۱۲	5
	Cultural and Social Anthropology	ZK	2
-	e aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diver		
anthropological research	from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	alth, history, deat	h, etc) will be
shown. The course is pres	sented in Czech.		
1	ntroduction to Linux	Z	. 2
	with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become	e familiar with bas	sic commands
·	like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). ntroduction to Optical Networks	Z,ZK	4
	ew of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on po		•
-	logy and on their solutions. The course will include the history of optical communications, an overview of passive componen	-	
dispersion compensators	, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sys	stems). The cours	e will also cover
·	s presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such		
· · · · · · · · · · · · · · · · · · ·	sfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters	. Students will so	lve real tasks
from practice. NI-VCC	Virtualization and Claud Computing	Z,ZK	5
	Virtualization and Cloud Computing dge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and		-
-	tion principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficient	_	
performance parameters	of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti	ve technology too	day for the
-	computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skill	ls in the use of mo	dern integration
	continuous integration and development).	714	
	Virtual game worlds	ZK	4
	s to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current si ory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world.	•	
	he task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.		, , ,
BI-VR1	Virtual reality I	KZ	4
	ality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements		
	e ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves co	mputational think	king, empathy
and shared social activitie		V7	
· ·	Virtual reality II e Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The ol	KZ hiective is to deve	lon applications
	gamification in various social metaverse and desktop engines.	0,000,000,000,000	nop applications
BI-VAK.21	Selected Applications of Combinatorics	Z	3
1	uce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the		we approach the
• • • • • • • • • • • • • • • • • • • •	theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic		
	on of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) in		
·	solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimi tions to the studied problems with a special focus on the effective use of existing tools.	zation and more.	Students will
	Selected Mathematical Methods	Z,ZK	4
l l	n introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then a		
-	troduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the		
the linear programming pr	roblem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.		
NI-VYC	Computability	Z,ZK	4
	ive functions and effective computability.		
	Bachelor internship abroad for 10 credits	Z	10
	ithin his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or r		
·	e FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess ses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits of		
	n institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	•	
exceeds the academic ye	ar's dead-line.		
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	ithin his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or r		
·	FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess		
	ies BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits on institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	· ·	
exceeds the academic ye	·	o two oubjects	and anternally
,			

BI-ZS30	Bachelor internship abroad for 30 credits	7	30
	e within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or	research institution	
	f the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess		
•	ourses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits		
	reign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	•	
exceeds the academ	·	u into two subjects	s ii tile iiiteirisiiip
		1/7	4
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
•	system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim		
	oot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion c		
	pation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to g	et practical experi	ence with these
technologies.			
BI-ZPI	Process engineering	KZ	4
Students will learn fu	ndamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles	of process model	ing and they will
learn basics of the us	ed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of t	business processe	ae ueina madarn
CASE tools. The role			ss using modern
C/ 10 L 10010. THE TOIC	of process engineering for information systems development is discussed as well as its importance in the overall context of info	•	•
an enterprise.	of process engineering for information systems development is discussed as well as its importance in the overall context of info	•	•
	of process engineering for information systems development is discussed as well as its importance in the overall context of info PHP Framework Nette - basics	•	•
an enterprise.		ormation and busi	ness strategy of
an enterprise. BI-ZNF Students will gain the	PHP Framework Nette - basics	ormation and busi	ness strategy of
an enterprise. BI-ZNF Students will gain the	PHP Framework Nette - basics basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czeck	ormation and busi	ness strategy of
an enterprise. BI-ZNF Students will gain the knowledge should se	PHP Framework Nette - basics basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czeck rive for the efficient creation of a web backend in PHP language. Fundamentals of iOS Application Development for iPhone and iPad	ormation and busi	ness strategy of 3 ork. The resulting
an enterprise. BI-ZNF Students will gain the knowledge should se BI-IOS	PHP Framework Nette - basics basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czeck rive for the efficient creation of a web backend in PHP language. Fundamentals of iOS Application Development for iPhone and iPad	ormation and busi	ness strategy of 3 ork. The resulting
an enterprise. BI-ZNF Students will gain the knowledge should se BI-IOS This course is preser	PHP Framework Nette - basics basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czeck refer the efficient creation of a web backend in PHP language. Fundamentals of iOS Application Development for iPhone and iPad ted in Czech. Introduction to Web and User Interfaces	KZ h popular framewo	3 ork. The resulting

ΚZ

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:

3D Printing

Credits in the group: 0 Note on the group:

BI-3DT.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	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	٧
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, František Ková, Martin Holec, Julia Plotnikova, Martin Šutovský, Jakub Tetera, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-BEK.21	Secure Code Josef Kokeš	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	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	٧
BI-HWB.21	Hardware Security Ji í Bu ek, Martin Šutovský, Ond ej Staní ek Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	٧
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Conceptual Modelling Robert Pergl Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
FIT-ITI	Modern IT infrastructure Ivan Šime ek, Tomáš Vondra, Jan Fesl Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	Z,L	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MGA.21	Multimedia and Graphics Applications Ji í Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	V

BI-PGR.21	Computer graphics programming	Z,ZK	5	2P+2C	L	V
BI-PRS.21	Practical Statistics Petr Novák	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	ZK	5	2P+2C	L	V
BI-PGA.21	Programming of Graphic Applications Ji i Chludil, Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PJS.21	JavaScript Programming Monika Borkovcová	KZ	5	3C	L	V
BI-PYT.21	Python Programming Martin Šlapák, Ond ej Bouchala, Mohamed Bettaz, Antonín Hruška, Yannick Daniel Gibson, Adam Skluzá ek Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	V
BI-PRR.21	Project management Tomáš Šubrt, Petra Pavlí ková, 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 Zden k Rybola	Z,ZK	5	2P+1C	L	V
BI-SP1.21	Team Software Project 1 Zden k Rybola	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 Libor Dostálek, Jan Kubr 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	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	Z,ZK	5	2P+2C	L	V
BI-TJV.21	Ji í Dostál Java Technology Stanislav Kuznetsov, Jan Blizni enko, Raian Samerkhanov Stanislav Kuznetsov Stanislav Kuznetsov (Gar.)	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, Jan Ko í Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TUR.21	User Interface Design	Z,ZK	5	2P+2C	L	V
BI-TWA.21	Jan Schmidt Design of Web Applications Martin Urbanec, David Bernhauer, Otto Šleger 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 Klas, Št pán Pechman, Miroslav Štaffa, Martin Mareš Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-UKB.21	Introduction to Cybersecurity Jan B Iohoubek, František Ková, Ivana Trummová, Jakub Tetera, Martin Mandík, Tomáš Lu ák, David Pokorný David Pokorný Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	V
BI-VES.21	Embedded Systems Miroslav Skrbek	Z,ZK	5	2P+2C	L	V
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar	Z,ZK	5	2P+2C	L	V
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
BI-VPS.21	Selected Topics in Computer Networking	Z,ZK	5	2P+2C	L	V
BI-VWM.21	Pavel Tvrdík Searching the Web and Multimedia Databases	Z,ZK	5	2P+1C	L	V
BI-FEM.21	Ji í Novák Fundamentals of Economics	Z,ZK	5	2P+2C	Z	V
BI-ZRS.21	Tomáš Evan Tomáš Evan Tomáš Evan (Gar.) Basics of System Control	Z,ZK	5	2P+2C	Z	V
BI-ZSB.21	Kate ina Hyniová Kate ina Hyniová Kate ina Hyniová (Gar.) Basics of System Security Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	V

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

Z,ZK

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

BI-ML1.21 Machine Learning 1 7.7K

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 Z,ZK

5

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

BI-ADU.21 Unix Administration Z,ZK

5

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

BI-AWD.21 Web and Database Server Administration Z.ZK

5

Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and backup complex database and web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.

BI-ASB.21 Applied Network Security Z,ZK

The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks.

BI-BEK.21 Secure Code

Z,ZK

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

BI-BIG.21 DB Technologies for Big Data

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

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

5

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

Ethical Hacking

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

Financial Business Intelligence

The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems.

BI-HWB.21 Hardware Security Z.ZK

The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.

BI-IOT.21 Internet of Things Z.ZK

5

The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS).

BI-JPO.21	Computer Units	Z,ZK	5
•	pasic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail		
• .	er units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using app	•	
·	ganization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, inclu	_	
•	nd serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of cor e architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micro		
	dware design kits (FPGA).	oprogrammed pro	cessor simulator
BI-KOM.21	Conceptual Modelling	Z,ZK	5
	proficeptual Modelling on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key		
	correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological st		
	n how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data repres	-	
learn the foundations of	enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEM	O method and the	BPMN notation
will be taught. The cour	se is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI	l.	
BI-MDF.21	Modern Data Formats	KZ	3
The goal of the course	is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type a	and the data forma	its used for that
data type along with too	ols available to work with such data. After finishing the course, the students should know how to work with common data, e.g.	on the Web.	
FIT-ITI	Modern IT infrastructure	Z,ZK	5
· · · · · · · · · · · · · · · · · · ·	ime-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A		
	complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologie	s. The proposed s	olution should
	inuous and economically optimal operation.	7.71	
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
	d with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for we		
	will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to		
= -	n to use multimedia transmission and representation systems, including real-time multimedia processing. They understand th cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.	ie principie or ope	ialion and use
BI-PGR.21		Z,ZK	5
	Computer graphics programming set, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design	l ' I	
•	iaterials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		ŭ
	ne, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe		
	nt, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and su		
BI-PRS.21	Practical Statistics	KZ	5
	oduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose i		
	ion and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	_	
methods on data from r	eal problems.		
BI-PNO.21	Practical Digital Design	KZ	5
Students get an overvie	, wo of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand †		UIDI Issausaa
Otadonto got an ovorvio	w of the contemporary digital design now and learn practical skills to use synchronous design techniques. They understand t	the basics of the V	HDL language
-	hnologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		1
-			1
and implementation ted			1
and implementation tectools. BI-PAI.21 The aim of the course is	hnologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern Law and Informatics s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge	ZK of doing business	CAD design 5 s in the Czech
and implementation tectools. BI-PAI.21 The aim of the course is Republic and will be also	hnologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern Law and Informatics s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge orted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding control of the pitfalls that await them in business from the point of view of law. They will understand the process of concluding control of the pitfalls that await them in business from the point of view of law. They will understand the process of concluding control of the pitfalls that await them in business from the point of view of law. They will understand the process of concluding control of the pitfalls that await them in business from the point of view of law.	ZK of doing business	5 in the Czech
and implementation tectools. BI-PAI.21 The aim of the course is Republic and will be alse environment, will know	Law and Informatics s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge arted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding contheir responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able	ZK of doing business ontracts in real and to use commercia	5 s in the Czech d Internet al license types
and implementation tectools. BI-PAI.21 The aim of the course is Republic and will be ale environment, will know and open-source licens	Law and Informatics s to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge erted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding or their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able es. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	ZK of doing business ontracts in real and to use commerciation against their mi	5 in the Czech d Internet al license types suse. Students
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BI-SP2.21	Team Software Project 2	KZ	5
Students gain hands-or	experience with the iterative development process while working on a large-scale software project. The first iteration is the res	sult of the BIE-SP1	1 course project.
	up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will we		people. The
	ne 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
	s to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administre e course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained	-	
with real network infras		Tby practical flatio	3-on expendince
BI-ML2.21	Machine Learning 2	Z,ZK	5
	is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in		
	the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction met		
basic principles of reinfe	orcement learning and natural language processing.		
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
Camera systems are be	ecoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluat	e image information	on. The course
	lifferent types of camera systems and a variety of methods for image and video processing. The course is focused on practical	use of camera sys	stems for solving
<u> </u>	at the graduates may encounter.		
BI-SRC.21	Real-time systems	Z,ZK	5
	sic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issu- tentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab		
course.	teritally verified in computer labs. The course is mainly locused on embedded KT systems, therefore the design kits in the lab	are trie same as i	III the BIE-VES
BI-TAB.21	Applications of Security in Technology	Z,ZK	5
	is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stu		_
-	ons and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.	The second second	
BI-TJV.21	Java Technology	Z,ZK	5
The goal is to provide k	nowledge and skills for developing information systems and applications through concepts used in software development and		oraries and tools
from Java language eco	osystem. At the course end, the students are able to develop software systems in Java platform.		
BI-TPS.21	Computer Networks Technologies	Z,ZK	5
	students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the phys	-	
	provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies are explained in the labs.	-	
•	ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Eth	ernet, modern wir	eless networks,
always with focus on hi		7.71	_
BI-TIS.21	Information Systems	Z,ZK	5
	is to familiarise students with the information systems topic and information systems implementation principles. During the co		
_	ptypes of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other If the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa		- 1
	prmation system implementation based on the project management principles. The emphasis is on the initial customer analys	=	-
•	er to implement any existing information system or to develop a new one from scratch. These factors determine the information	-	- 1
	e information systems security, operation, support, maintenance, legislation impacts, and government information systems to		
BI-TUR.21	User Interface Design	Z,ZK	5
_	verview of methods for designing and testing common user interfaces. They get experience to solve the problems where soft	. , .	-
communicate with the u	iser 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 dev	elopment process to ensure optimal interface for them.		
BI-TWA.21	Design of Web Applications	Z,ZK	5
The basic course of we	b application development. Initially, the students become familiar with HTTP and its possibilities and partly with some propert	ies of language de	escribing the
. , ,	resentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web application		
	te the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symf	ony 2, Doctrine 2.	Developments
	e demonstrated using a JavaScript language with library jQuery and possibly MV* framework React.	7.71	_
BI-IDO.21	Introduction to DevOps	Z,ZK	5
	he topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of		
	oort software development, testing and compilation. It also focuses on tools for automating infrastructure management and bu duction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquai		-
used in practice.	addition to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquait	med with modern	technologies
BI-UKB.21	Introduction to Cybersecurity	Z,ZK	5
	is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic concepts in modern approach to cybersecurity.		-
· ·	s, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.		
BI-VES.21	Embedded Systems	Z,ZK	5
	n embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and emb		
peripheral circuits, prog	ramming methods, and applications. They get practical skills with development kits and tools.		
BI-VDC.21	Virtualization and Data Centers	Z,ZK	5
The aim of the course is	s to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design	and implementation	on of data center
	various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data	_	
•	uds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications		
	operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa		
BI-VIZ.21	Data Visualization	KZ	5
	rerview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understa	_	
• •	th as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preproce		- 1
	uch as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications programming language.	or soldeted metho	Jas to real-World
BI-VPS.21	Selected Topics in Computer Networking	Z,ZK	5
	the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technically students will be considered to the program.		
	a networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practi	_	-
	earning important methods of local area and wide area networks from the viewpoint of functionality, performance, and securit	· ·	

BI-VWM.21 Searching the Web and Multimedia Databases Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). BI-FEM.21 Fundamentals of Economics Z,ZK The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. **Basics of System Control** The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. Basics of System Security BI-ZSB.21 Z.ZK 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: Code Name of the course Completion **Credits** BI-3DT.1 3D Printing ΚZ RI-A2I English language, preparation for the B2 level exam 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-AAG.21 Automata and Grammars Z,ZK 5 Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions, and regular grammars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages and they understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes P and NP BI-ACM Programming Practices 1 5 This is a selective course for preparing talented student for representation in international programming contests. BI-ACM2 Programming Practices 2 ΚZ 5 This is a selective course for preparing talented student for representation in international programming contests BI-ACM3 **Programming Practices 3** ΚZ 5 This is a selective course for preparing talented student for representation in international programming contests. BI-ACM4 Programming Practices 4 ΚZ 5 This is a selective course for preparing talented student for representation in international programming contests. BI-ADU.21 Unix Administration 7.7K 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-ADW.1 Z,ZK Windows Administration 4 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-AG1.21 Algorithms and Graphs 1 Z,ZK 5 The course covers 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. Z,ZK BI-AG2.21 Algorithms and Graphs 2 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1.21. It further delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.21. BI-ALO Algebra and Logic Z.ZK 4 The course extends and deepens the study of topics touched upon in the basic course in logic. Programming for the Android Operating System BI-AND.21 ΚZ 4 This course is presented in Czech. **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

BI-ANG1 English Language Examination without Preparatory Courses Z,ZK 2

BI-ANGK English language, contact 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

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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, This course is presented in Czech. Advanced technologies in Java.	ZK	4		
BI-APS.21 Architectures of Computer Systems Z, Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphipipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of in not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the seque program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and systems.	struction pential mode	orocessing el of the		
BI-ARD Interactive applications on Arduino The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for m kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i. not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable Software Engineering students.	e. to see th	e results		
BI-ASB.21 Applied Network Security Z, 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 cours security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course knowledge of security applications in computer networks.				
The course complements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer science that 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: algorithms="" easy.<="" make="" of="" principles="" td="" the="" understanding="" www.that=""><td>w.algovisio</td><td>on.org>)</td></http:>	w.algovisio	on.org>)		
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 conversely be serviced by the principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a vertical service.	-			
	7	14		
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 wit theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program	needs to r	un with		
administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense DL DLC 24	against th	iem.		
BI-BIG.21 DB Technologies for Big Data K Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused processing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation of individual technologies will be supplemented with specific examples from practice.	ata proces	sing (data		
BI-BLE Blender Z, The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applied				
BI-BPR.21 Bachelor project 1. At the beginning of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the partial tas 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 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/stude 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 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 can be supplemented and approved at the end of the semester.	ks that he in the semes ont/studijni/fi	1 / she will ster. 2. The ormulare). ne student		
BI-CCN Compiler Construction Z, This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compil understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of		5 dents to		
	Z n, types of d class inst	ancing,		
BI-CS2 C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).				
BI-CS3 Language C# - design of web applications K The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development on this platform. They will learn to create WebAPI and to use it by client programs.	Z elopment p	4 ossibilities		
	ZK	5		
	uage, as w ncepts of to	ell as with ransaction		

	ses with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database optimizing database applications, distributed database systems, data stores.	,	augging and
BI-DML.21	Discrete Mathematics and Logic	Z,ZK	5
	quainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from		-
	paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course combinatorics and number theory, with emphasis on modular arithmetics.	-	-
BI-EHA.21	Ethical Hacking	Z,ZK	5
The goal of the cou	urse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulne	rabilities, and th	eir possible
exploitation in comp	outer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is c vulnerabilities testing and the following process of penetration test documentation.	n hands-on exp	erience with
BI-EHD	Introduction to European Economic History	Z,ZK	3
1	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	,	1
BI-EJA	Enterprise Java	Z,ZK	4
ı	dvanced technologies in the Java programming language. The focus is on technologies for development of enterprise information syst a database and are accessed through the web interface.	•	connected to
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4
t t	vanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise information architecture, that can be deployed to the cloud.		microservice
BI-EP1.24	Effective programming 1 The course is taught in Czech.	KZ	4
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Effic	cient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individu		e discussed,
BI-EPP.21	Economic Business Processes	Z,ZK	5
	se is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and		
	onment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the c	=	
establishment of the	e company, through the management of property and capital structure, financing of the company, determining the cost function of the evaluating the financial health of the company and its eventual rehabilitation or termination.	company and la	abor costs, to
BI-FBI.21	Financial Business Intelligence	Z,ZK	5
	se is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business a	,	_
	for comparison with other companies and management decision process at the tactical and strategic level. The second view is management	-	-
for financial manager	ment and prediction of business development. Management accounting allows monitoring of the financial status and performance of bu	usiness activities	s over several
accounting periods	s, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and	to use value info	ormation to
assess options rela	ated to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intell	igence modules	in business
	information systems, decision support systems, and other knowledge-oriented systems.		
BI-FEM.21	Fundamentals of Economics	Z,ZK	5
	Fundamentals of Economics he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It	,	_
The course allows th	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It of fundamental microeconomic and macroeconomic topics.	contains a gene	_
The course allows the	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting	contains a gene	eral overview
BI-FMU The aim of the cours	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting se is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the part	Z,ZK	5 g operations,
BI-FMU The aim of the cours operations in account	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting se is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the part ints and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification	Z,ZK icular accountin of bookkeeping	5 g operations,
BI-FMU The aim of the cours operations in account	he students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting se is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the part into and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification attions based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management.	Z,ZK icular accountin of bookkeeping	5 g operations,
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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). Cryptography and Security BI-KAB.21 Z,ZK Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to use cryptographic keys and certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in applications. Within labs, students will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of cryptanalysis. BI-KOM.21 Conceptual Modelling The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. **BI-KOT** Programing in Kotlin 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 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 Z,ZK 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 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech. BI-LOG.21 Mathematical Logic Z,ZK 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 7.7K 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-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. BI-MGA.21 Multimedia and Graphics Applications Z.ZK Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for working with images, videos, 3D graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphic formats, and compression technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the principle of operation and use of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models. **BI-MIT** Mikrotik technologies The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are commonly used by the small and middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the metallic, optical or wireless links and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer networks concepts like protocols and technologies of the data-link, network and transport layer of the OSI model. BI-ML1.21 Machine Learning 1 Z,ZK The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and

variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimension demonstrations, pandas and scikit libraries in Python will be used.	nal data visualization.	In practical
BI-ML2.21 Machine Learning 2	Z,ZK	5
The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular to the selected advanced methods of machine learning.		
and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction meth basic principles of reinforcement learning and natural language processing.		ents get the
BI-MMP Multimedia team project This course is presented in Czech.	KZ	4
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 University to the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices aids. Let a represent the PC side and paripheral devices are represented to the PC side and parip		
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of U 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 aug	Z,ZK	5
nigh resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mention		
and procedural visualization, scientific data visualization, and 3D model scanning. BI-OOP.21 Object-Oriented Programming	Z,ZK	5
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 togeth		_
course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The em		-
for developing software, which includes testing, error handing, refactoring, and application of design pattern.		
BI-OPT Introduction to Optical Networks	Z,ZK	4
Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on po	•	
of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive componer dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission syst		
he most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such a	•	
ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters	s. Students will solve	real tasks
from practice.		
BI-ORL Operations Research and Linear Programming The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fund	KZ	5 toobnique
Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (s	•	
BI-OSY.21 Operating Systems	Z,ZK	5
n 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 in	mplementations, race	
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS mo		le to design
and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS BI-PA1.21 Programming and Algorithmics 1	Z.ZK	7
Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, sti		
statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searc with linked lists and trees.	ching, sorting, and ma	anipulating
	Z,ZK	anipulating 7
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, q	Z,ZK lueue, enlargeable an	7 ray, list, set,
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BI-PJV	Programming in Java	Z,ZK	4
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	'	
BI-PKM	Introduction to mathematics This course is presented in Czech.	Z	4
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be worki	ng with modern technical and scientific software. Students will learn how to use different programming styles (functional programn etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	ning, rule-based pr	rogramming
BI-PNO.21	Practical Digital Design	KZ	5
•	view of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the		
and implementation	technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in tools.	idustry-standard C	AD design
BI-PPA.21	Programming Paradigms	Z,ZK	5
programming paradigr	basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par m and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstrated on mode	ne principles are de	emonstrated
DI DDD 24	such as C++ and Java.	Z,ZK	5
BI-PRR.21	Project management se is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, anal	'	_
	ion, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as		
	rce schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st		
deepening their know	wledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar	ge companies. The	e course is
BI-PRS.21	also suitable for all those who will develop software or hardware in the form of team projects. Practical Statistics	KZ	5
I I	riactical Statistics itroduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose modern	l	_
will encompass regre	ession and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software methods on data from real problems.	e R and will apply	the studied
BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a gene	eral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi	on, they gain a de	eper insight
BI-PSI.21	into shell and some other particular scripting languages and will get practical experience with shell script programming.	Z,ZK	5
	Computer Networks students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local r	'	-
	will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network		
	ically verify configurations and management of network devices in the lab within the environment of the operating systems Linux a	nd Cisco IOS.	
BI-PST.21	Probability and Statistics	Z,ZK	5
	e basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T	-	
	variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction wn distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistica	=	-
estillations of unknown	the statistical dependence of two or more random variables.	i nypomeses and t	aetermining
BI-PYT.21	·	KZ	5
	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data	a processing. The	differences
The aim of the cours	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format	a processing. The or a support of a Jupyter notel	differences book, which
The aim of the cours	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format ent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester	a processing. The or a support of a Jupyter notel	differences book, which
The aim of the cours between philosophy of enables greater acce	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format ent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester the semester.	a processing. The of a Jupyter notely work will be assig	differences book, which lined during
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The aim of the cours between philosophy of enables greater access BI-QAP Course aims at giving are based, and algority on Python language. BI-QUA This course introduct development and will analysis, design at BI-SAP.21 Students will get accommender and will get accommender and will get accommender and the profession of the profession	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format and to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester the semester. Quantum algorithms and programming students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on the showing advantages and limitations of quantum computing. During tutorials students work in open-source software development of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM might be an advantage. No previous knowledge of physics is assumed. Quality Assurance Computer Structure and automated testing. At the end of the semester, the student should set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found computer. Structure and Architecture quainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arith cation, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proce in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. Computer Engineering Seminar I uter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to idually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the semester. Computer Engineering Seminar II uter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to idually w	a processing. The of a Jupyter notes of a Jupyter n	differences cook, which ined during 5 technologies ich is based with Python 4 f software erform a test der test. 5 tontrollers, implemented 4 ks. Students ith scientific new for each 4 al countries mic freedom
The aim of the cours between philosophy of enables greater access BI-QAP Course aims at giving are based, and algority on Python language. BI-QUA This course introduct development and will analysis, design at BI-SAP.21 Students will get accommended in the seminar of Compare approached indivarticles and other professional particles and other professional procession in the course is present and key regions of worden accounts of the course is present and key regions of worden accounts accounts between the course is present and key regions of worden accounts accounts between the course is present and key regions of worden accounts accounts between the course is present and key regions of worden accounts accounts between the course is present and key regions of worden accounts accounts between the course is present and key regions of worden accounts	Python Programming se is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format ent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester the semester. Quantum algorithms and programming students hands-on experience with quantum computing. During tutorials students work in open-source software development of the semester of the seminar teacher semester. Computer Engineering Seminar II uter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to semester. Computer Engineering Seminar II uter Engineeri	a processing. The of a Jupyter notes of a Jupyter n	differences cook, which ined during 5 technologies ich is based with Python 4 from a test der test. 5 technologies, mplemented 4 ks. Students ith scientification for each 4 del countries mic freedom

BI-SIP.21 **Network Programming** 5 The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming using BSD sockets. The second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware technologies. The final part introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computer labs using a chosen programming language environment. BI-SKJ.21 Scripting Languages 1 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming. BI-SOJ Machine Oriented Languages Z,ZK Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use of microprocessor's features and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view linked to higher level languages. This knowledge will be used during reverse engineering, optimization, and evaluation of code security. BI-SP1.21 Team Software Project 1 ΚZ Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the BIE-SWI course that runs concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software artefact will be further developed and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 K7 5 Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BIE-SP1 course project. However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their solution. Administration of Computer Networks and Services BI-SPS.21 Z,ZK 5 The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated under the operating systems Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by practical hands-on experience with real network infrastructure. BI-SQL 1 Language SQL, advanced K7 Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In particular stored program unites, triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of view of specialized database structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and possibilities of its. changes will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS and partially on PostgreSQL. BI-SRC.21 Real-time systems Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are the same as in the BIE-VES course Network Technology 1 BI-ST1 7 3 The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited under the Cisco Netacad -CCNA1 - R&S Introduction to Networks. BI-ST2 Network Technology 2 Ζ 3 This course is presented in Czech. BI-ST3 Network Technology 3 Ζ 3 Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses will get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. Network Technology 4 BI-ST4 Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running. **BI-STO** Storage and Filesystems Z,ZK The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling load balancing and high availability. Machine vision and image processing Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate image information. The course introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use of camera systems for solving problems of practice that the graduates may encounter. Software Engineering BI-SWI.21 Z,ZK Students get acquainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They consolidate and practically verify their knowledge during the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-on experience with CASE tools using the visual language UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design and testing. Within the course, students also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their development. BI-TAB.21 Applications of Security in Technology 5 The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security. **BI-TDA** Test driven architecture ΚZ The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are well known in the DevOps world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in the semester project. **Documentation and Presentation** The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically final university theses. Students learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present it in front of classmates and

the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed. BI-TEX 7 7K 4 TeX and Typography This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course focuses on typographic rules Information Systems The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-TJV.21 Java Technology The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z,ZK 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks. BI-TS1 Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Ζ 4 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TUR.21 User Interface Design Z.ZK Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BI-TWA.21 Design of Web Applications Z.ZK The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React. BI-TZP.21 Technological Fundamentals of Computers Z,ZK Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-UKB.21 Introduction to Cybersecurity The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations BI-ULI 2 Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). BI-UOS.21 Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell. BI-VAK.21 Selected Applications of Combinatorics The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. Virtualization and Data Centers The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.

BI-VES.21 Embedded Systems Z,ZK 5 Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. Virtual game worlds The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices. **Data Visualization** The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language. Selected Mathematical Methods **BI-VMM** The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and their properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples. Selected Topics in Computer Networking The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technologies used in modern computer networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real network devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and security. Virtual reality I Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared social activities. BI-VR2 Virtual reality II Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The objective is to develop applications for computer science and gamification in various social metaverse and desktop engines. BI-VWM.21 Searching the Web and Multimedia Databases Z,ZK Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). **BI-ZIVS** Intelligent Embedded System Fundamentals ΚZ Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. PHP Framework Nette - basics **BI-ZNF** 3 Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. BI-ZPI Process engineering ΚZ Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. Z,ZK BI-ZRS.21 Basics of System Control The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. Bachelor internship abroad for 10 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Bachelor internship abroad for 20 credits 20 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS30 Bachelor internship abroad for 30 credits 30 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.

BI-ZSB.21	Basics of System Security	Z,ZK	5
•	ourse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forens analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder	•	
Such as marware a	as well as skills needed for independent work in the area of operating system security incident analysis.	in operating system	ns security,
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	roduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques neede		' '
	lecision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot, but also leads to the course can be represented for example by a physical robot.		entity, such
	virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art d		4
BI-ZWU	Introduction to Web and User Interfaces This course is presented in Czech.	Z,ZK	4
BIE-CSI	Introduction to Computer Science	Z	2
	bry class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other five	_	
science, high-scho	pol students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go	oal of the class is to	o introduce
and relate basic p	rinciples of computer science for students to understand, early on, what computer science is, why things such as high-level program	ning languages an	d tools are
	are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no		
questions but also	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interes than expected, or even less than before.	itea in computer so	cience more
BIE-DIF	Differential equations	Z,ZK	5
This course provide	is a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential so		
of variables. Key t	heorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered wi	h methods like cha	aracteristic
	sis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world application	=	
partial differential	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	ing implicit
BIE-EEC	English language external certificate	Z	4
-	se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Engli	_	
	the B2 level of the Common European Framework of Reference for Languages.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh ar	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	ble to apply them i	in particular
BIE-SEG	examples.	Z	0
	Systems Engineering ory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of o		
	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking		
understand the	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what con	ncurrency is, as op	posed to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic i-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm		
	be presented as well.		,
FIT-ACM1	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM2	Programming Practices 2	KZ	5
FIT-ACM3	This is a selective course for preparing talented student for representation in international programming contests. Programming Practices 3	KZ	5
TTI-AONIS	This is a selective course for preparing talented student for representation in international programming contests.	INZ	, ,
FIT-ACM4	Programming Practices 4	KZ	5
'	This is a selective course for preparing talented student for representation in international programming contests.	'	
FIT-ACM5	Programming Practices 5	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM6	Programming Practices 6	KZ	5
CIT ITI	This is a selective course for preparing talented student for representation in international programming contests.	7.71/	-
FIT-ITI with a very limited a	Modern IT infrastructure and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A mo	Z,ZK	uting center
•	e as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies.	•	٠ ا
	thus be capable of continuous and economically optimal operation.		
FIT-SEP	World Economy and Business	Z,ZK	4
	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by c	· -	
	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of d		
corruption and coo	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	oddolono bacca c	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
FIT-TOP	Academic writing	Z	2
Publishing is an im	portant and required part of research activity. It is not only about obtaining research results but also about applying them in the form	of publication. Writi	ng scientific
-	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 cou		
	icle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an ourse will be taught in blocks, with theoretical part at the beginning of the semester and one practical at the end of the semester/begin		-
cisc s article. The U	will be determined based on the availability of enrolled students.	imig of the example	onou. Dales
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	ices a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco		
of the key periods	in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	history. From large	economic
	and the second s		
	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution and a specific property of particular property institutions and a	· ·	
	tailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events, institutions and countries but rather the impact of trade and role of particular events.	· ·	
		· ·	

NI-AFP	Applied Functional Programming	KZ	5
	ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional p s and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master		
the fise flowadays	necessary competence of a software engineer: the theory and especially the practice.	ing this paradigin i	Jecomes a
NI-DDM	Distributed Data Mining	KZ	4
Course focuses on	state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of	on experience with	large scale
data processing fra	amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a approaches to parallelize other algorithms. The course is prezented in czech language.	ind will be capable	to propose
NI-DSP	Database Systems in Practes	Z,ZK	4
	This course is presented in Czech.		
NI-DZO	Digital Image Processing	Z,ZK	4
	ints a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als		I
-	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR		
	abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray converges to the converge converges and cloning and cloning digital photo-montage.		
	gid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		
NI-IAM	Internet and Multimedia se is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq	Z,ZK	4
	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical u	-	
•	nissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effective of the control of		
the quality and late	ncy of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording th	e scene up to the p	resentation
NII I OM	for audience.	1/7	-
NI-LSM The subject is original	Statistical Modelling Lab ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p	KZ ut on the effective	5 use of the
	on and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, an		
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesi	-	· ·
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	-	
	plex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development n		
	ing object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of		
technologies in ter	ms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involven	ent in the Pharo C	Consortium.
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
Mathematical se	emantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scot Introduction to category theory.	model of lambda	calculus.
NI-OLI	Linux Drivers	Z,ZK	4
	g system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po	,	
	ability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development		lents. The
	urse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practic	-	
NI-PDD	Data Preprocessing repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s	Z,ZK	5
•	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris		- 1
	pages.	3	
NI-PSD	Public Services Design	KZ	4
	oduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p	=	-
suppliers (devs a	and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration Course is aimed at students-designers as well as clients.	i with client repres	entatives.
NI-PSL	Programming in Scala	Z,ZK	4
The course introdu	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature		tching and
advance standard li	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,
NI DEV	Scalaz, etc.	7 71/	
NI-REV	Reverse Engineering cquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before	Z,ZK	5
-	will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated by the course is deducated by the course is dedicated by the course is deducated by the course is		
applications writ	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de	edicated to debugg	ers: how
debuggers and de	ebugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer	malware scene. The	ne focus of
NI-SYP	the course is on the seminars, where students will solve practically oriented tasks from the real world.	Z,ZK	5
	Parsing and Compilers upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va		
	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 equip	ment. They
NI-VCC	will be able to compute, analyze, and control the reliability and availability of the designed circuits. Virtualization and Cloud Computing	Z,ZK	5
	virtualization and Cloud Computing in 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 effecti		-
management of cor	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in and development tools (Continuous integration and development).	tne use of moderr	n integration
	and development tools (Continuous integration and development).		

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 2025-10-20, time 12:10.