# Study plan

# Name of study plan: Bachelor program, unspecified specialization, in Czech, 2024

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Unspecified Specialisation of Study

Garantor of the study branch: doc. RNDr. Ing. Marcel Ji ina, Ph.D.

Program of study: Informatika Type of study: Bachelor full-time

Required credits: 123 Elective courses credits: 57 Sum of credits in the plan: 180

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

Róbert Lórencz, CSc. email: robert.lorencz@fit.cvut.cz

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 121

The role of the block: PP

Code of the group: BI-PP.21

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

2021

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

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

Credits in the group: 106

Note on the group:

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

your 5th semester of study. Otherwise, enroll in the course BI-PSI.21 in your 3rd semester of study. Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Completion Credits Code Scope Semester Role members) Tutors, authors and guarantors (gar.) Algorithms and Graphs 1 BI-AG1.21 Z.ZK 5 2P+2C Ζ PP Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek **Dušan** Knop Dušan Knop (Gar.) Automata and Grammars BI-AAG.21 Z,ZK 2P+2C Ζ Jan Holub, Jan Janoušek **Jan Holub** Jan Holub (Gar.) **Bachelor Thesis** BI-BAP.21 Ζ 14 L.Z PP Zden k Muziká (Gar.) Zden k Muziká **Bachelor project** BI-BPR.21 1 0P+0C Z.L PP Zden k Muziká Zden k Muziká (Gar.) Database Systems Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, Z,ZK BI-DBS.21 L 5 2P+2R+1L PP Pavel Kíž, Št pán Pechman, Dominik Roudný, Jan Bittner, ..... Ji í Hunka Michal Valenta (Gar.) **Discrete Mathematics and Logic** 2P+1R+1C Ζ BI-DML.21 Z,ZK 5 PΡ Ji ina Scholtzová, Daniel Dombek, Jan Sp vák Daniel Dombek Jan Sp vák **Cryptography and Security** Ivana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Róbert BI-KAB.21 L Z,ZK 5 2P+2C PΡ Lórencz, Julia Plotnikova, David Pokorný, Jakub Tetera Róbert Lórencz Róbert Lórencz (Gar.) Linear Algebra 1 Ζ BI-LA1.21 Z,ZK 2P+1R+1C 5 PΡ Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda (Gar.)

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

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

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

BI-AAG.21 Automata and Grammars

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

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

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

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

BI-DBS.21 Database Systems Z,ZK 5

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

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

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

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

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

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

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

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

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

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.

Code of the group: BI-AAG 3/5 SEM

Name of the group: BI-AAG.21 in the third or fifth semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

Note on the group:

If you plan to profile the specialization Artificial Intelligence or Web Engineering, enroll in the course BI-AAG.21 for your 5th semester of study. Otherwise, enroll in the course BI-AAG.21 for

your 3rd semester of study

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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-AAG.21	Automata and Grammars  Jan Holub, Jan Janoušek <b>Jan Holub</b> Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=BI-AAG\_3/5\_SEM Name=BI-AAG.21 in the third or fifth semester

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.

Code of the group: BI-PSI\_2/4\_SEM

Name of the group: BI-PSI.21 in the second or in the 4th semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

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 for your 2nd semester of study. - If you plan to profile the specialization Computer Graphics, Computer Engineering, Theoretical Informatics, or Artificial Intelligence, enroll in the course

BI-PSI.21 for your 4th 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-PSI.21	Computer Networks Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, Josef Koumar, Petr Hoda, Josef Zápotocký, Michal Polák, Jan Fesl Jan Fesl (Gar.)	Z,ZK	5	2P+1R+1C	L	PP

## Characteristics of the courses of this group of Study Plan: Code=BI-PSI\_2/4\_SEM Name=BI-PSI.21 in the second or in the 4th semester

BI-PSI.21 Computer Networks

7K

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.

Code of the group: BI-PST\_3/5\_SEM

Name of the group: BI-PSI.21 in the third or in the fourth semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

Note on the group: If you plan to profile yourself in the Artificial Intelligence specialization, enroll in the course

BI-PST.21 for your 3rd semester of study. Otherwise, enroll in the course BI-PST.21 for your

5th 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-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

#### Characteristics of the courses of this group of Study Plan: Code=BI-PST\_3/5\_SEM Name=BI-PSI.21 in the third or in the fourth semester

BI-PST.21 Probability and Statistics

Z,ZK

5

Students will learn the basics of probabilistic thinking, the abile 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.

Name of the block: Elective vocational courses in the branch/specialization

Minimal number of credits of the block: 0

The role of the block: VO

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

Name of the group: Profiling (future compulsory) courses of all specializations of the bc. program Informatics,

ver. 21

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: From this group, select courses that will later be compulsory for the specialization in

which you intend to profile.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)					
BI-ADU.21	Unix Administration  Zden k Muziká, Petr Zemánek, Miroslav Prágl <b>Zden k Muziká</b> Zden k  Muziká (Gar.)	Z,ZK	5	2P+2C	L	VO
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	VO
BI-AG2.21	Algorithms and Graphs 2  Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek <b>Ond ej</b> Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-APS.21	Architectures of Computer Systems  Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	VO
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	VO
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-FBI.21	Financial Business Intelligence  David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	VO
BI-HWB.21	Hardware Security Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B Iohoubek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-LA2.21	Linear Algebra 2  Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek  Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MPP.21	Methods of interfacing peripheral devices  Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	VO
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MGA.21	Multimedia and Graphics Applications Ji ( Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji ( Chludil (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-PGR.21	Computer graphics programming Petr Felkel, Jaroslav Sloup Jaroslav Sloup Petr Felkel (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-PRS.21	Practical Statistics Kamil Dedecius, Petr Novák Petr Novák (Gar.)	KZ	5	1P+2C	L	VO
BI-PNO.21	Practical Digital Design Martin Novotný Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	VO
BI-PAI.21	Law and Informatics  Zden k Ku era, Št pánka Havlíková, Dominik Vítek, Martin Samek, Ji í Maršál,  Michal Mat jka <b>Št pánka Havlíková</b> Zden k Ku era (Gar.)	ZK	5	2P+2C	L	VO
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-PPA.21	Programming Paradigms  Jan Janoušek, Tomáš Pecka, Petr Máj, Tomáš Jakl <b>Jan Janoušek</b> Jan  Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	VO
BI-PGA.21	Programming of Graphic Applications Ji í Chludil, Radek Richtr Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	VO
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	VO
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	VO

BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	VO
BI-SWI.21	Software Engineering Michal Valenta, Ji i Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	VO
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	VO
BI-SPS.21	Administration of Computer Networks and Services  Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	VO
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-SVZ.21	Machine vision and image processing Marcel Ji ina, Jakub Novák, David Kramný, Justýna Frommová <b>Jakub Novák</b> Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	VO
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il <b>Jaroslav Borecký</b> Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TJV.21	Java Technology Stanislav Kuznetsov, Jan Blizni enko, Ji í Dan ek, Raian Samerkhanov <b>Ji í</b> Dan ek	Z,ZK	5	2P+2C	Z	vo
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	Z	vo
BI-TIS.21	Information Systems Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-TWA.21	Design of Web Applications David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-IDO.21	Introduction to DevOps Michal Valenta, Ji í Mlejnek, Tomáš Vondra, Zden k Rybola Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák <b>David Pokorný</b> Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	VO
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VIZ.21	Data Visualization  Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	VO
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdik Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal Ji í Novák Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZSB.21	Basics of System Security  Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona  Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-ZNS.21	Knowledge-based Systems Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	Z	VO

Characteristics of the courses of this group of Study Plan: Code=BI-PS-ALL.21 Name=Profiling (future compulsory) courses of all specializations of the bc. program Informatics, ver. 21

BI-ADU.21 Unix Administration

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

BI-AWD.21 Web and Database Server Administration

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

BI-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-ASB.21 Applied Network Security The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks. **Architectures of Computer Systems** Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such BI-BEK.21 Secure Code Z,ZK 5 The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. DB Technologies for Big Data BI-BIG.21 Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice. **Economic Business Processes** Z,ZK The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-EHA.21 Z,ZK 5 **Ethical Hacking** The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-FBI.21 Financial Business Intelligence Z,ZK 5 The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. 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 7.7K 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 5 Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KOM.21 Conceptual Modelling Z,ZK 5 The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. BI-LA2.21 Linear Algebra 2 Z,ZK 5 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech BI-LOG.21 Z,ZK 5 Mathematical Logic The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained. Methods of interfacing peripheral devices The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices.

BI-MDF.21	Modern Data Formats	KZ	3
•	s to give an overview of commonly used data formats for typical types of data. There will be a description of each data type a s available to work with such data. After finishing the course, the students should know how to work with common data, e.g.		its used for that
	Modern Visualisation Technologies	Z,ZK	5
	s to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	′	
_	e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment		
and procedural visualiza	tion, scientific data visualization, and 3D model scanning.		
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
• .	with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wo		
• .	vill be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to to use multimedia transmission and representation systems, including real-time multimedia processing. They understand th	•	
	ards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.	e principie di opei	allon and use
	Object-Oriented Programming	Z,ZK	5
I	ming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	, , , , , , , , , , , , , , , , , , ,	
course students get acq	uainted with the main principles of object-oriented programming and design, used in modern programming languages. The er	nphasis is on prac	ctical techniques
	which includes testing, error handing, refactoring, and application of design pattern.		
BI-PGR.21	Computer graphics programming	Z,ZK	5
	e, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design aterials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		
	ne, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe		
	t, 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
	duced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose i	-	
	on and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	are R and will app	ly the studied
methods on data from re	Practical Digital Design	KZ	5
	r ractical Digital Design v of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand t	ı	- 1
	inologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		1
tools.			
BI-PAI.21	Law and Informatics	ZK	5
	to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge	_	
-	ted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding coneir responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able		
	is. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection		
•	ch behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses o	-	
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	mpiling methods of programming languages. They are introduced to intermediate representations used in current compilers (		· ·
·	a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification guage but any text in a language generated by a given LL input grammar.	i. The compiler ca	n translate not
	Programming Paradigms	Z.ZK	5
	asic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of	, ,	-
programming paradigm	and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming	. The principles ar	re demonstrated
	on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main	stream programm	ning languages
such as C++ and Java.	D : (O I: A I: I:	7 71/	
BI-PGA.21	Programming of Graphic Applications he possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the	Z,ZK	5
•	matical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both usin		
by implementation of plu		,	3.1.3.1
BI-PJS.21	JavaScript Programming	KZ	5
	ction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code devel	opment in Javasc	ript easier.
BI-PYT.21	Python Programming	KZ	5
	to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for the Pytho		
	rogramming in Python and in other programming languages will be explained. Each topic is prepared for students in the forn o individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semest		
the semester.	o individual stadont from Boloro additiab, stadonto pado a onon tost on the tast from topic. Four nomentatio place a comost	or work will be do	oignod dannig
BI-PRR.21	Project management	Z,ZK	5
The aim of the course is	to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, and	alysis, crisis man	agement in a
• •	argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk		
	chedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for ge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I		
	e who will develop software or hardware in the form of team projects.	arge companies.	The course is
	Network Programming	Z	5
	mental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming network applications.		
	o designing communication protocols and their verification. The third part introduces the principles and applications of middle	•	
	models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in convergence.	mputer labs usino	g a chosen
BI-SWI.21	Software Engineering	Z,ZK	5
-	with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	· .	-
• .	ne analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hand		
	e UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig	_	hin the course,
students also gain a the	pretical basis in the field of project management, estimation of costs of software projects, and methods of their development		

Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the BIE-SWI course that runs concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software artefact will be further developed and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 ΚZ 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. BI-SPS.21 Administration of Computer Networks and Services Z.ZK 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-ML1.21 Machine Learning 1 7.7K 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. Z.ZK BI-ML 2.21 Machine Learning 2 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. BI-SVZ.21 Machine vision and image processing Z.ZK 5 Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate image information. The course introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use of camera systems for solving problems of practice that the graduates may encounter. Real-time systems Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are the same as in the BIE-VES course BI-TJV.21 Java Technology Z,ZK 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z,ZK 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks BI-TIS.21 Information Systems Z.ZK 5 The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. User Interface Design 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. **Design of Web Applications** The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV\* framework React. BI-IDO.21 Introduction to DevOps Z,ZK The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systems and services. The course covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and building and deploying software to the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquainted with modern technologies used in practice. BI-UKB.21 Introduction to Cybersecurity Z,ZK 5 The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations. Embedded Systems Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. BI-VDC.21 Virtualization and Data Centers Z.ZK 5 The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.

BI-VIZ.21 **Data Visualization** 

The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language.

BI-VPS.21 Selected Topics in Computer Networking Z,ZK

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

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

Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents)

BI-FEM.21 Fundamentals of Economics Z.ZK

5

The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics

Basics of System Control BI-7RS 21

The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control.

BI-ZSB.21 Basics of System Security

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

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.

Knowledge-based Systems

Students will become familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intelligence to solve problems that require human judgment, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowledge-based systems to support decision-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutionary algorithms.

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group:

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

continuate at the level of at load B2 abbording to the Commen Earopean's famount of Nelectones.							
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 c	an he recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in F	nalish comparable	to or exceeding

the B2 level of the Common European Framework of Reference for Languages

BI-ANG English Language, Internal Certificate ZK 2
Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG

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

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.24

Name of the group: Physical Education, version 2024

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

The role of the block: V

Code of the group: BI-V.2021

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

2024/25

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

Credits in the group: 0

Note on the group:

Note on the group.						
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-ALO	Algebra and Logic Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era Lud k Ku era (Gar.)	Z,ZK	4	2P+1C	L	V
BI-A2L	English language, preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V

BIE-ZUM  BIE-ZUM  BIE-ZUM  BI-BLE  Blender  Lukáš Ba inka Lukáš Ba Tomáš Vichta Tomáš V  BI-STO  Storage and Filesy  BIE-DIF  BIE-DIF  Differential equatic  Antonella Marchesiello, Ond ej Bouchala (Gar.)  NI-DZO  Digital Image Proc  NI-DDM  Distributed Data M  BI-EP1.24  BI-EP2  BI-ANGK  BI-ANGK  English language, Kate ina Valentová  BI-EJA  BI-EJA  BI-EJK  BI-EJK  BI-FMU  BI-FMU  BI-FMU  Artificial Intelligen Pavel Surynek  Blender  Lukáš Ba inka Lukáš in  Aukáš Ba inka Lukáš in  Antonáš Vichta Tomáš V  Antonále Pešek, Ond ej Bi  David Pešek, Ond ej Bi  David Pešek, Ond ej Bi  David Buchtela  Bi-BLAMA  BI-	ce Fundamentals  Ba inka Lukáš Ba inka (Gar.)  Si in Practes Vichta Tomáš Vichta (Gar.) Vistems  Pesign Vém David Pešek Ond ej Brém (Gar.)  Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  Lessing  Lining  ming 1 Lia er Martin Ka er (Gar.)  ming 2 Lia er Martin Ka er (Gar.)  contact preparation for the B2 level exam  Kate ina Valentová (Gar.)  agement Accounting	KZ         Z,ZK         Z,ZK         Z,ZK         Z,ZK         KZ         KZ         KZ         Z,ZK         Z,ZK         Z,ZK         Z,ZK         Z,ZK         Z,ZK	5 4 4 4 4 5 4 4 4 4 2 4	2P+1C 2P+2C 2P+2C 2P+1C 2P+2C 1P+2C 2P+2C 2P+1C 3C 2P+2C 2P+2C 2P+2C	L L L,Z L L Z L Z,L	V V V V V V V V
BI-BLE  BI-BLE  Blender Lukáš Ba inka Lukáš Ba Tomáš Vichta Tomáš V  BI-STO  Storage and Filesy  Public Services De David Pešek, Ond ej Bi  BIE-DIF  BIE-DIF  Differential equatic Antonella Marchesiello, Ond ej Bouchala (Gar.)  NI-DZO  Digital Image Proc  NI-DDM  Distributed Data M  BI-EP1.24  Effective programm Martin Ka er Martin K  BI-EP2  Efficient Programm Martin Ka er Martin K  English language, Kate ina Valentová  BI-EJA  BI-EJA  BI-EJK  Enterprise Java Ji í Dan ek Ji í Dan ek Ji í Dan BI-FMU  BI-HAM  BI-HAM  HW accelerated ne	Ba inka Lukáš Ba inka (Gar.) s in Practes //chta Tomáš Vichta (Gar.) //stems esign rém David Pešek Ond ej Brém (Gar.) Ons Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  essing lining ming 1 fa er Martin Ka er (Gar.) ming 2 fa er Martin Ka er (Gar.) contact preparation for the B2 level exam Kate ina Valentová (Gar.)  and Kotlin ek Ji í Dan ek (Gar.) ragement Accounting	Z,ZK Z,ZK Z,ZK KZ Z,ZK KZ KZ KZ KZ KZ	4 4 4 4 5 4 4 4 2	2P+2C 2P+1C 2P+2C 1P+2C 2P+2C 2P+1C 3C 2P+2C 2P+2C 2P+2C	L L,Z L L L L L L	V V V V V V V V
NI-DSP  Database Systems Tomáš Vichta Tomáš Ni-DSP  BI-STO  Storage and Filesy Public Services Do David Pešek, Ond ej Bi Differential equation Antonella Marchesiello, Ond ej Bouchala (Gar.)  NI-DZO  Digital Image Proc Ni-DDM  Distributed Data Martin Ka er Martin Ka	s in Practes Vichta Tomáš Vichta (Gar.) Vistems Pesign Prém David Pešek Ond ej Brém (Gar.)  Dons Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  Pressing  Ilining Pring 1 Pring 2 Pring a er Martin Ka er (Gar.)  Pring 2 Pring 2 Pring a er Martin Ka er (Gar.)  Contact preparation for the B2 level exam  Kate ina Valentová (Gar.)  Ind Kotlin Pring ek Ji í Dan Pek (Gar.)  Ragement Accounting	Z,ZK Z,ZK KZ Z,ZK Z,ZK KZ KZ KZ Z,ZK	4 4 4 5 4 4 4 2	2P+1C 2P+2C 1P+2C 2P+2C 2P+1C 3C 2P+2C 2P+2C 2P+2C	L L,Z L L L L	V V V V V V V V
BI-BP2 BI-BP2 BI-BP2 BI-BI-BP2 BI-BI-BP3 BI-BI-BP3 BI-BP3 BI-BP4 BI-BP4 BI-BP4 BI-BP4 BI-BP4 BI-BP5 BI-BP5 BI-BP5 BI-BP5 BI-BP6 BI-BP7	Vichta Tomáš Vichta (Gar.)  Vistems  Pesign  Viém David Pešek Ond ej Brém (Gar.)  Ons  Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  Pessing  Ilining  Ming 1  Via er Martin Ka er (Gar.)  Ming 2  Via er Martin Ka er (Gar.)  Contact preparation for the B2 level exam  Kate ina Valentová (Gar.)  Ad Kotlin  ek Ji í Dan ek (Gar.)  agement Accounting	Z,ZK  KZ  Z,ZK  Z,ZK  KZ  KZ  KZ  Z,ZK	4 4 5 4 4 4 2	2P+2C 1P+2C 2P+2C 2P+1C 3C 2P+2C 2P+2C 2C	L,Z  L  L  L  L  L	V V V V V V V
BI-STO Storage and Filesy NI-PSD Public Services De David Pešek, Ond ej Bi BIE-DIF BIE-DIF Differential equatic Antonella Marchessiello, Ond ej Bouchala (Gar.) Digital Image Proc NI-DDM Distributed Data M BI-EP1.24 Effective programm Martin Ka er Martin K BI-EP2 Efficient Programm Martin Ka er Martin K English language, Kate ina Valentová BI-EJA BI-EJK Enterprise Java Ji í Dan ek BI-FMU BI-HAM HW accelerated ne	ystems esign eśm David Pešek Ond ej Brém (Gar.) ons Jan Valdman, Ond ej Bouchala Tomáš Kalvoda eessing lining ming 1 fa er Martin Ka er (Gar.) ming 2 fa er Martin Ka er (Gar.) contact preparation for the B2 level exam Kate ina Valentová (Gar.) ad Kotlin ek Ji í Dan ek (Gar.) agement Accounting	KZ Z,ZK Z,ZK KZ KZ Z Z,ZK	4 5 4 4 4 4 2	1P+2C 2P+2C 2P+1C 3C 2P+2C 2P+2C	L L L	V V V V V
BIE-DIF  David Pešek, Ond ej Bile-DIF  Differential equation Antonella Marchesiello, Ond ej Bouchala (Gar.)  Digital Image Proce  NI-DDM  Distributed Data Martin Ka er Martin	rém David Pešek Ond ej Brém (Gar.)  Ons Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  ressing  lining ming 1 fa er Martin Ka er (Gar.) ming 2 fa er Martin Ka er (Gar.)  contact preparation for the B2 level exam Kate ina Valentová (Gar.)  and Kotlin ek Ji í Dan ek (Gar.) ragement Accounting	Z,ZK  Z,ZK  KZ  KZ  KZ  Z	5 4 4 4 4 2	2P+2C 2P+1C 3C 2P+2C 2P+2C 2C	L L Z L	V V V V V
Differential equatic Antonella Marchesiello, Ond ej Bouchala (Gar.) NI-DZO Digital Image Proc Digital Image Proc Distributed Data Martin Ka er Marti	Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  Jessing  Jan Valdman, Ond ej Bouchala Tomáš Kalvoda  Jessing  Jesnif  Jesnif  Jesnif  Jesnif  Jesnif  Jesnif  Jesnif  Jesnif  Jesn	Z,ZK KZ KZ Z Z,ZK	4 4 4 4 2	2P+1C 3C 2P+2C 2P+2C 2C	L L Z L	V V V
NI-DDM  BI-EP1.24  BI-EP2  BI-ANGK  BI-EJA  BI-EJA  BI-EJK  BI-EJK  BI-EJK  BI-FMU  BI-FMU  Distributed Data M  Effective programs  Martin Ka er Martin K  English language, Kate ina Valentová  Enterprise Java  Ji í Dan ek  Enterprise Java ar  Ji í Dan ek Ji í Dan  Financial and Man  David Buchtela  HW accelerated ne	lining ming 1 (a er Martin Ka er (Gar.)) ming 2 (a er Martin Ka er (Gar.)) contact preparation for the B2 level exam Kate ina Valentová (Gar.)  nd Kotlin ek Ji í Dan ek (Gar.) agement Accounting	KZ KZ KZ Z Z,ZK	4 4 4 2	3C 2P+2C 2P+2C 2C	L Z L	V V
BI-EP1.24  BI-EP2  Effective program Martin Ka er Martin K ernglish language, Kate ina Valentová  BI-EJA  BI-EJK  Enterprise Java Ji í Dan ek Enterprise Java ar Ji í Dan ek Ji í Dan BI-FMU  BI-HAM  BI-HAM  HW accelerated ne	ming 1 (a er Martin Ka er (Gar.) ming 2 (a er Martin Ka er (Gar.)  contact preparation for the B2 level exam Kate ina Valentová (Gar.)  nd Kotlin ek Ji í Dan ek (Gar.) agement Accounting	KZ KZ Z Z,ZK	4 4 2	2P+2C 2P+2C 2C	Z L	V
BI-EP2  BI-ANGK  BI-EJA  BI-EJK  BI-EJK  BI-FMU  BI-FMU  Martin Ka er	ia er Martin Ka er (Gar.)  ming 2 ia er Martin Ka er (Gar.)  contact preparation for the B2 level exam Kate ina Valentová (Gar.)  nd Kotlin ek Ji í Dan ek (Gar.)  agement Accounting	KZ Z Z,ZK	4 2	2P+2C 2C	L	V
BI-ANGK  BI-ANGK  BI-EJA  BI-EJA  BI-EJK  BI-FMU  BI-FMU  Martin Ka er Martin K  English language, Kate ina Valentová  Enterprise Java Ji í Dan ek Ji í Dan ek Ji í Dan Financial and Man David Buchtela  HW accelerated ne	contact preparation for the B2 level exam Kate ina Valentová (Gar.)  nd Kotlin ek Ji í Dan ek (Gar.) agement Accounting	Z Z,ZK	2	2C		•
BI-EJA  BI-EJK  BI-EJK  BI-FMU  BI-FMU  BI-HAM  Kate ina Valentová  Enterprise Java ar  Ji í Dan ek Ji í Dan  Financial and Man David Buchtela  HW accelerated ne	Kate ina Valentová (Gar.)  nd Kotlin ek Ji í Dan ek (Gar.) agement Accounting	Z,ZK			Z,L	
BI-EJK  BI-EJK  Enterprise Java ar  Ji i Dan ek  Ji i Dan ek  Ji i Dan ek  Ji i Dan ek  Ji i Dan  Ji i Dan ek  Ji i Dan  Ji i	ek Ji í Dan ek (Gar.) agement Accounting		4		,	V
BI-HAM  Ji i Dan ek Ji i Dan Financial and Man David Buchtela  HW accelerated no	ek Ji í Dan ek (Gar.) agement Accounting	Z,ZK	+	2P+2C	L	٧
BI-FMU Financial and Man David Buchtela  BI-HAM HW accelerated no	agement Accounting		4	2P+2C	L	V
RI-HAM HW accelerated no		Z,ZK	5	2P+2C	Z	V
Tomáš ejka Karel Hv	etwork traffic monitoring nek <b>Tomáš ejka</b> Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI History of Mathem	natics and Informatics Solcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
Interactive applica	` ′	KZ	4	3С	L	V
NI-IAM Internet and Multin	nedia	Z,ZK	4	2P+1C	L	V
BIE-CSI Introduction to Co	mputer Science toph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
BIE-IMA2 Introduction to Ma		Z	2	1C	Z	V
BI-CS2 C# language and c	data access t pán Pavel Št pán (Gar.)	KZ	4	0P+3C	Z	٧
BI-CS3 Language C# - des	sign of web applications	KZ	4	3C	Z	V
BLSOL 1 Language SQL, ad		KZ	4	3C	L	V
Quantum algorithm	ms and programming tr Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	V
NI-I SM Statistical Modellin		KZ	5	3C	L	V
RI-HAS Human Aspects in	Cryptography and Security Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	٧
NI-MPL Managerial Psychologian Fiala Jan Fiala Jan Fiala	ology	ZK	2	2P	Z,L	V
	ctures in Computer Science	Z,ZK	4	2P+1C	L	V
BLMDD 21 Methods of interfa	cing peripheral devices lav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MIT  Mikrotik technolog Jan Fesl Jan Fesl Jan	jies	KZ	3	1P+2C	Z	V
NI-MOP Modern Object-Or	iented Programming in Pharo t Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	V
RI_M\/T 21 Modern Visualisati	• • • • • • • • • • • • • • • • • • • •	Z,ZK	5	2P+2C	Z	V
BI-MMP Multimedia team p		KZ	4	3C	Z,L	V
BI-ORI Operations Resear	rch and Linear Programming nop Dušan Knop (Gar.)	KZ	5	1P+2C	L	V
NI-OLI Linux Drivers	av Borecký <b>Jaroslav Borecký</b> Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
RI-ACM Programming Prac	• • • • • • • • • • • • • • • • • • • •	KZ	5	4C	L	V

BI-ACM2	Programming Practices 2	KZ	5	4C	Z	V
BI-ACM3	Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)  Programming Practices 3	KZ	5	4C	L	V
BI-ACM4	Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)  Programming Practices 4	KZ	5	4C	 	V
-	Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)  Programming for the Android Operating System					
BI-AND.21	Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma <b>Jan Mottl</b> Marek Kodr (Gar.)	KZ	4	3C	L	V
BI-CS1	Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán (Gar.)	KZ	4	3C	L,Z	V
BI-PJV	Programming in Java  Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík  Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	٧
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
BI-KOT	Programing in Kotlin Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica	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 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing	Z,ZK	5	2P+1C	Z	V
BI-PKM	Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.) Introduction to mathematics	Z		2	 	
	Tomáš Kalvoda Tomáš Kalvoda (Gar.)		4			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 Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II  Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Network Technology 4 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	L	V
BI-SKJ.21	Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2+2	L	٧
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers	Z,ZK	5	2P+1C	Z	V
BI-GIT	Jan Janoušek Jan Janoušek Jan Janoušek (Gar.)  Version control system GIT	KZ	2	16P	Z,L	V
BIE-SEG	Petr Pulc Systems Engineering	Z	0	2C	Z	V
TVK1	Christoph Kirsch Christoph Kirsch (Gar.)  Physical Education	Z	1		L,Z	V
TVV	Luboš Neuman Ji í Drnek (Gar.) Physical education	Z	0	0+2	Z,L	V
TV1	Physical Education	 Z	0	0+2	,_ 	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2	Physical Education	Z	0	0+2	L	V
TV2K1	Physical Education 2	Z	1		L,Z	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
BI-TS1	Theoretical Seminar I Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II  Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV	Z	4	2C	L	V
	Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)		-			<u> </u>

BI-TDA	Test driven architecture  Marek Hakala	KZ	4	2P+1C	Z,L	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	KZ	4	3С	Z	V
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká, Petr Zemánek, Jan Ž árek <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	٧
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	V
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán Petr Klán Petr Klán (Gar.)	KZ	3	1P+2C	L	V
BI-VAK.21	Selected Applications of Combinatorics Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability  Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ZS10	Bachelor internship abroad for 10 credits  Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
BI-ZS20	Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
BI-ZS30	Bachelor internship abroad for 30 credits  Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji i Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad  Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces  Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V
	the courses of this group of Study Plan: Code=BI-V.2021 Name=Pon from 2021/22 till 2024/25	urely Electiv	e Cours	es of Bac	helor Pro	gramme
BI-MPP.21 The course is focused o includes both PC side a	Methods of interfacing peripheral devices  n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focus nd peripheral devices side. Labs are practically oriented. Students gain experience with imp	•		Universal ser	•	•
	on development, and APIs of selected devices.				7K	5

Informatics, version from 2021/22 till 2024/25						
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5			
The course is focused o	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Univ	ersal serial bus (Ú	SB). The course			
includes both PC side a	nd peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of <code>l</code>	JSB devices, Linu	x and Windows			
drivers, simple application	on development, and APIs of selected devices.					
BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5			
The goal of the course is	s to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	gmented reality, v	risualization on			
high resolution displays	(e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment	ioned technologie	s, namely fractal			
and procedural visualiza	ation, scientific data visualization, and 3D model scanning.					
TV1	Physical Education	Z	0			
TVV	Physical education	Z	0			
TVK1	Physical Education	Z	1			
TVV0	Physical education	Z	0			
TV2	Physical Education	Z	0			
TVKZV	Physical Education Course	Z	0			
TVKLV	Physical Education Course	Z	0			

BI-ADW.1 This course is present	Windows Administration ted in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-ALO The course extends a	Algebra and Logic  nd deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AVI.21	Algorithms visually	Z,ZK	4
The course compleme	ents other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute		end substantially
	n BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.o	rg <http: td="" www.al<=""><td>govision.org&gt;</td></http:>	govision.org>
	ing the principles of algorithms easy.		r
BI-A2L	English language, preparation for the B2 level exam	Z	2
	urse corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme		
	uage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by		
BI-APJ	Aplication Programming in Java	Z,ZK	4
NI-AFP	ted in Czech. Advanced technologies in Java.  Applied Functional Programming	KZ	5
This course is present	ted in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function	al programming la	anguages are or
the rise nowadays and	the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas	stering this paradio	gm becomes a
necessary competence	e of a software engineer: the theory and especially the practice.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduce	ed to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class	ssical tasks from t	he areas of state
	gent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	ithms and the neu	ral networks, wil
be presented as well.		1	
BI-BLE	Blender	Z,ZK	4
	nowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for thos		
	complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphi		
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is present		1	
BI-STO	Storage and Filesystems	Z,ZK	4
	principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	archiving, as so as	storage scaling
load balancing and hig			T .
NI-PSD	Public Services Design	KZ	4
The course will introdu	uce students to specifics of UX, Service design and development for public sector. We will look into the design and developme	nt process from th	e perspective of
	esignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati	ion with client repr	resentatives.
Course is aimed at stu	udents-designers as well as clients.		
		Z,ZK	resentatives.
Course is aimed at stu BIE-DIF	udents-designers as well as clients.	Z,ZK	5
Course is aimed at stu BIE-DIF This course provides a of variables. Key theor	Differential equations  foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essentions on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered	Z,ZK al solution method	5 ds like separatio characteristic
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BI-HAM HW accelerated network traffic monitoring This course introduces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. To network traffic are mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as	_	- 1
for analysis). The goals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network t level and to develop their practical abilities in this field.	raffic on a hardwa	re and software
BI-HMI History of Mathematics and Informatics	Z,ZK	3
This course is presented in Czech.  BI-ARD Interactive applications on Arduino	KZ	4
The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple appl kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded 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	d systems, i.e. to se	ee the results
Software Engineering students.	s is suitable everi	or web and
NI-IAM Internet and Multimedia The NI-IAM course is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes ac	Z,ZK	4
presentation of AV signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic audiovisual transmissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the quality and latency of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording for audience.	cal use case scena effect of various co	rios of real-time emponents on
BIE-CSI Introduction to Computer Science This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other	Z er fields but interes	2
science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level progra done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested, or even less than before.	goal of the class i mming languages not just basic com	s to introduce and tools are puter science
BIE-IMA2 Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a examples.	re able to apply the	em in particular
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 Mic get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current ter of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mc (XML description).	chnologies such a _ (LINQ to Objects a using domain-spe	s LINQ - a set , LINQ to XML ecific objects
BI-CS3 Language C# - design of web applications	KZ	4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overvion thisplatform. They will learn to create WebAPI and to use it by client programs.	w of the developm	nent possibilities
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 triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the postructures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle PostgreSQL.	int of view of speci and possibilities o	alized database f its. changes
BI-QAP Quantum algorithms and programming  Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software develon Python language. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VM might be an advantage. No previous knowledge of physics is assumed.	opment kit Qiskit,	which is based
NI-LSM Statistical Modelling Lab	KZ	5
The subject is oriented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is available information and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis).		
BI-HAS   Human Aspects in Cryptography and Security  This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for develop use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.	Z,ZK ers. Students of th	5 nis course can
NI-MPL Managerial Psychology	ZK	2
NI-MSI Mathematical Structures in Computer Science  Mathematical semantics of programming languages. Data types as continuous lattices, Scott topology. Procedures as continuous mappings. The Scot	Z,ZK	4 calculus.
Introduction to category theory.		· carcarae.
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 of	KZ	the small and
middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute and technologies of the data-link, network and transport layer of the OSI model.	e metallic, optical o	or wireless links
NI-MOP Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the sof object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involved.	kills of design and t needs and areas rk on interesting p	implementation of interest. In rojects and OO
BI-MMP Multimedia team project This course is presented in Czech.	KZ	4

BI-ORL Operations Research and Linear Programming	KZ	5
The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a f	undamental optimiz	ation technique.
Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as	management).	
NI-OLI Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combin		
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver develop		udents. The
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experien		
BI-ACM   Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		_
BI-ACM2 Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM3 Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM4 Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
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 fundament		
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class		•
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debug	gging and exception	processing, as
well as work with files are emphasized.		
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).	T	T
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 developm	•	
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	r 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 a		
The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development	or a modern, object	t-tunctional way
with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).	7.71	
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 fe	eatures - e.g.pattern	matching and
advance standard library Scale enables to use of applications functional natturns of a H List Monads, etc. Scale is used by many powerful framework	ke and librarios o a	Dlay Caccandra
advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful framework Scalaz, etc.	ks and libraries e.g.	Play, Cassandra,
Scalaz, etc.		-
Scalaz, etc.  BI-PMA Programming in Mathematica	Z,ZK	4
Scalaz, etc.  BI-PMA Programming in Mathematica Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional programming styles)	Z,ZK	4
Scalaz, etc.  BI-PMA Programming in Mathematica Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional project.), how to create dynamic interactive applications and visualisations, data processing and presentations.	Z,ZK gramming, rule-base	4 ed programming,
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Students gain a general coverview of available scopping anguages and will get prestoled expression with shall and some with which perfectled scopping anguages and will get prestoled expression with shall god programming.  B-SOU  Machine Oriented Languages  Students of the causes will gain an ability to create their zone programs in the assembly banguage of the most common PC platform focusing on optimal tare of microprocessor's features and efficient cooperation of software with hardware. Nat. there will be discussed 85 specifies of the microprocessor's features and efficient cooperation of software with hardware. Nat. there will be discussed 85 specifies of the microprocessor's features and their common processor's features and their common pr			
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Subdents of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimization of software with the discussed self-specification for anything of the course of the application point of verification of higher level individuals and the self-specification for anything of the self-specification of		7 7K	4
and officiant cooperation of software with hardware. Note, there will be discussed s86 specifics of the majority of OSes from the application point of view linked to higher level languages. This is knowledge will be used during revenue engineering, optimization, and evaluation of ood security.  B-SEP  World Economy and Business  This course is presented in Zeach. The course introduces students of technical university to the international business. It does that predominantly by companying individual countries and key regions of vivorid economy. Students get to how about different religions and cultures, accessary for cong putiness in diverses conceived as well as increase of economic freedom, and with a new reader for the region technical university to the international business. It does that predominantly by companying individual countries and key regions of vivorid economy. Students get to have been defined to the control economic freedom. In addition, the property of the control economic freedom. In addition, the property of the property of the control economic freedom. In addition, the property of			
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It is advised to take bachelor level of this course BIE-SEP as a peregulative.  NI-SYP   Parsing and Compilers  The monitor builds upon the knowledge of undernerate of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of IR parsing and me introduced to basic properties of various variants and applications of IR parsing and me introduced to basic properties of various variants and applications of IR parsing and me introduced to basic promiselps of version control system STPsep principles will be then shown on DCVS (it both theoretically and practically in the products of basic principles of version control systems. These principles will be then shown on DCVS (it both theoretically and practically in the principle system to the principle systems to the principle system of the principle system of the principle system is the principle of various on the principle system of the pri			
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BIE-SEG   Systems Engineering   Z   0   This is an introductory dass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of operating systems for students to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the class, students are able to understand the difference between processes and threads such continue efficiently to overcome concurrency for communication.  TV2K1   Physical Education 2   Z   4   Theoretical Seminar   Theoretical Seminar   Theoretical Seminar   Theoretical Seminar   Theoretical Seminar   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 ine potentials of the teachers of the seminar.  BI-TS2   Theoretical Seminar   I   Theoretical Semin			rticular system
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class it to introduce basic principles of operating systems for students to understand processor and memory virtualization, seeing and actually understanding virtualization is the overarching thems of the class. After taking the class, subtreash are able to understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concurrency is, as opposed to parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.  TVEKT   Physical Education 2   Z   4    BI-TS1   Theoretical Seminar I   Theoretical Seminar I   Z   4    BI-TS2   Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.  BI-TS2   Theoretical Seminar II   Z   4    Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical 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 II   Z   4    Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves wi			
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BI-TEX	TeX and Typography	Z,ZK	4
	I in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	ne course focuses	on typographic
rules.	Introduction to Common Common United	7.71/	
BI-EHD	Introduction to European Economic History I in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
BI-KSA	Cultural and Social Anthropology	ZK	2
,	se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diver	ı	
	n from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	=	
shown. The course is pro	esented in Czech.	-	
BI-ULI	Introduction to Linux	Z	2
Students become familia	ar 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	ic commands
and techniques of a Uni	x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).		
BI-OPT	Introduction to Optical Networks	Z,ZK	4
=	riew of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on po	-	
•	ology and on their solutions. The course will include the history of optical communications, an overview of passive componen s, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sys		
	s, and others), and an overview or active components (optical switches and amplifiers, high-speed conferent transmission systems or presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such	•	
	nsfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters		
from practice.			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowl	edge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	l organizations. Th	ney will get
acquainted with virtualiz	ation principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiency	ciently operate an	d optimize the
	s of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti		-
	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
BI-VHS	Continuous integration and development).	ZK	
-	Virtual game worlds ts to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current st	I	4 e is furthermore
	eory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world.	_	
· · · · · ·	the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.		
BI-VR1	Virtual reality I	KZ	4
· ·	eality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements	of virtual worlds	communication.
The course focuses on t	he ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves co	mputational think	ing, empathy
and shared social activit	ies.		
BI-VR2	Virtual reality II	KZ	3
	se Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The ol	bjective is to deve	lop applications
· · · · · · · · · · · · · · · · · · ·	d gamification in various social metaverse and desktop engines.		
BI-VAK.21	Selected Applications of Combinatorics	Z	3
· · · · · · ·	and the state of t	1	-
	duce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the	e basic courses, v	ve approach the
issue from applications t	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	e basic courses, v sic data structure	ve approach the s. Furthermore,
issue from applications to with the active participate	o theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some ba ion of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) in	e basic courses, v sic data structure nformatics. Areas	ve approach the s. Furthermore, from which we
issue from applications to with the active participat will select problems to b	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	e basic courses, v sic data structure nformatics. Areas	ve approach the s. Furthermore, from which we
issue from applications to with the active participat will select problems to b	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some bation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) in e solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimi	e basic courses, v sic data structure nformatics. Areas	ve approach the s. Furthermore, from which we
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issue from applications with the active participat will select problems to be also try to implement so BI-VMM The lecture begins with	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basion of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) in a solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimilations to the studied problems with a special focus on the effective use of existing tools.  Selected Mathematical Methods	e basic courses, value of the structure	we approach the s. Furthermore, from which we Students will
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BI-ZPI	Process engineering	KZ	4			
Students will learn fund	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	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 info	ormation and busi	ness strategy of			
an enterprise.						
BI-ZNF	PHP Framework Nette - basics	KZ	3			
Students will gain the ba	asics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czecl	n popular framewo	ork. The resulting			
knowledge should serve	e for the efficient creation of a web backend in PHP language.					
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4			
This course is presente	d in Czech.					
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4			
This course is presente	d in Czech.					
BI-3DT.1	3D Printing	KZ	4			

Code of the group: BI-V-PRO\_MG

Name of the group: Elective Courses, Suitable for those who intend to apply for Master's program at FIT

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

Credits in the group: 0

Note on the group:

Courses in this group are recommended for students who intend to enroll to master

program at FIT.

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	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V-PRO\_MG Name=Elective Courses, Suitable for those who intend to apply for Master's program at FIT

BI-AG2   Algorithms and Graphs 2	∠,∠K	5	ı
This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsi	ory course BI-AG1	. It further delves	1
into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English	ersion of the cour	se see BIE-AG2.	l

### List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A2L	English language, preparation for the B2 level exam	Z	2
active part in the langua	e corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both te set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by in class of the term.	the midterm and the	e final term
BI-AAG.21	Automata and Grammars	Z,ZK	5
_	to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	1 '	1
and they und	ontext-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the derstand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity	classes P and NP.	
BI-ACM	Programming Practices 1  This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM2	Programming Practices 2	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM3	Programming Practices 3	KZ	5
·	This is a selective course for preparing talented student for representation in international programming contests.	•	•
BI-ACM4	Programming Practices 4	KZ	5
· ·	This is a selective course for preparing talented student for representation in international programming contests.	•	
BI-ADU.21	Unix Administration	Z,ZK	5
Students will learn the int	ernal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. The	y will understand the	e difference
between user and admin	istrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights	, file systems, disk	subsystem
processes, memory, ne	etwork services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the ki specific examples from practice.	nowledge from the I	ectures on
BI-ADW.1	Windows Administration	Z,ZK	4
ı	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	,	ı

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 pa 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 comple algorithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic notation.	5
algorithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic notation.	-
	xity of
BI-AG2   Algorithms and Graphs 2   Z,ZK	5
This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1. It further 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 BI	
BI-AG2.21 Algorithms and Graphs 2 Z,ZK	5
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 follows:	-
delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the cours	
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.	
BI-AND.21 Programming for the Android Operating System KZ	4
This course is presented in Czech.  BI-ANG English Language, Internal Certificate ZK	2
BI-ANG   English Language, Internal Certificate   ZK   Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG	2
	2
BI-ANG1 English Language Examination without Preparatory Courses Z,ZK 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: -1	_
active part in the language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the midterm and the fina	
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	
class of the term.	
BI-APJ Aplication Programming in Java Z,ZK	4
This course is presented in Czech. Advanced technologies in Java.	
BI-APS.21 Architectures of Computer Systems Z,ZK	5
Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given of	n 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	essing
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	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-ARD Interactive applications on Arduino KZ	4
The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for modern program	
kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i.e. to see the repetition of a PC. Thenke to possible control on higher (ebicative) layer this platform in frequently used for artist performance and therefore is suitable even for Well	
not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable even for Wel Software Engineering students.	Janu
BI-ASB.21 Applied Network Security Z,ZK	5
The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with	-
security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student wi	
knowledge of security applications in computer networks.	Ü
BI-AVI.21 Algorithms visually Z,ZK	4
The course complements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer science that extend subst	
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: td="" www.algovision.org<=""><td>org&gt;)</td></http:>	org>)
that make understanding the principles of algorithms easy.	
BI-AWD.21 Web and Database Server Administration Z,ZK	5
BI-AWD.21 Web and Database Server Administration Z,ZK 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.	
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BI-AWD.21 Web and Database Server Administration Z,ZK 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 web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.  BI-BAP.21 Bachelor Thesis Z BI-BEK.21 Secure Code Z,ZK	14 5
BI-AWD.21   Web and Database Server Administration   Z,ZK   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 web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.  BI-BAP.21   Bachelor Thesis   Z   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 many contents and solutions.	14 5 odeling
BI-AWD.21   Web and Database Server Administration   Z,ZK   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 web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.  BI-BAP.21   Bachelor Thesis   Z    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 method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions. After getting familiar with the threat method the sign phase of their own code and solutions.	14 5 odeling with
BI-AWD.21   Web and Database Server Administration   Z,ZK   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 web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.  BI-BAP.21   Bachelor Thesis   Z    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 m theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationship.	14 5 odeling with hips of
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BI-CS1 Programming in C# K7 The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing. constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized. BI-CS2 C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description). Language C# - design of web applications BI-CS3 K7 4 The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on thisplatform. They will learn to create WebAPI and to use it by client programs. BI-DBS.21 **Database Systems** Z,ZK 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 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-EHA.21 Ethical Hacking Z.ZK The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-EHD Z,ZK Introduction to European Economic History 3 This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). BI-EJA Enterprise Java Z,ZK 4 The course is on advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information systems which are connected to a database and are accessed through the web interface. Enterprise Java and Kotlin BI-FJK 4 The course is on advanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise information systems with microservice architecture, that can be deployed to the cloud. BI-EP1.24 Effective programming 1 ΚZ 4 The course is taught in Czech. BI-FP2 Efficient Programming 2 ΚZ 4 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors. BI-EPP.21 **Economic Business Processes** The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-FBI 21 Financial Business Intelligence Z,ZK The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. Fundamentals of Economics BI-FEM.21 5 The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. Financial and Management Accounting Z,ZK The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Inteligence moduls in Business information systems. **BI-GIT** Version control system GIT 2 Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practically. In this particular system even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server administrators BI-GIT.21 SW Development Technologies 3 This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to Git, the information manager from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use. HW accelerated network traffic monitoring This course introduces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The monitoring and analysis of network traffic are mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a source of information and data

level and to develop their practical abilities in this field.		nd software
BI-HAS Human Aspects in Cryptography and Security	Z,ZK	5
This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for develope		
use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BI-HMI History of Mathematics and Informatics  This course is presented in Czech.	Z,ZK	3
BI-HWB.21 Hardware Security	Z,ZK	5
The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the oper		
modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW re attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including		
for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.	applications and reli	ateu topics
BI-IDO.21 Introduction to DevOps	Z,ZK	5
The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of sys		The course
covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and built		
the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquair used in practice.	ited with modern ted	chnologies
BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.	112	7
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		d actuators,
wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT archite		
areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments	s (hardware - ARM,	ESP, STM;
software - Arduino, Raspberry Pi OS).  BI-JPO.21 Computer Units	Z,ZK	5
Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail		
organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appro		
of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including		
correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of comm		
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 micropi and programmable hardware design kits (FPGA).	ogrammed process	or simulator
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		-
certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in appearance will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic process.		
BI-KOM.21 Conceptual Modelling	Z,ZK	5
The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key t		
categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological stru		-
notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data represer		
learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up		MN notation
BI-KOT Programing in Kotlin	Z,ZK	
Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adva	_,	4
	inced language con	4 structions.
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-fun	structions.
with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages	modern, object-fun	structions. ctional 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	modern, object-fun	structions. ctional way
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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. Modern Data Formats BI-MDF.21 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. Mikrotik technologies **BI-MIT** 3 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 The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional data visualization. In practical demonstrations, pandas and scikit libraries in Python will be used. BI-ML2.21 Machine Learning 2 Z.ZK The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. **BI-MMP** ΚZ Multimedia team project 4 This course is presented in Czech. BI-MPP.21 Z,ZK Methods of interfacing peripheral devices 5 The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices. BI-MVT.21 Modern Visualisation Technologies The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning. BI-OOP.21 Object-Oriented Programming Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphasis is on practical techniques for developing software, which includes testing, error handing, refactoring, and application of design pattern. Introduction to Optical Networks Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possible problems with deployment of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive components (optical fibres, multiplexors, dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems). The course will also cover the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as the accurate time on Internet, ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. Students will solve real tasks from practice. **BI-ORL** Operations Research and Linear Programming 5 The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundamental optimization technique. Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as management) BI-OSY 21 Operating Systems In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread implementations, race conditions, critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitoring. They are able to design and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows BI-PA1.21 Programming and Algorithmics 1 Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching, sorting, and manipulating with linked lists and trees. BI-PA2.21 Programming and Algorithmics 2 Z,ZK Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, list, set, table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e.g., template programming, copying/moving of objects, operator overloading, inheritance, polymorphism). BI-PAI.21 Law and Informatics The aim of the course is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of doing business in the Czech Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding contracts in real and Internet environment, will know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to use commercial license types and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection against their misuse. Students will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of real cases from practice. Programming of Graphic Applications The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their use for visualization of specific data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using built-in scripting languages and by implementation of plugins.

BI-PGR.21	Computer graphics programming	Z,ZK	5
After attending this	curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the	scene, add textur	es imitating
geometric details ar	nd materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and ter	ms used in comput	er graphics,
such as graphical p	pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representir	ng solid fundament	als for your
professional develo	pment, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfac	es, and scientific v	isualization.
BI-PHP.1	Programing in PHP	KZ	4
The course is ta	ught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a	and will use tool th	at eases
	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register f		
·	register for this course in their 3rd semester of study.		•
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G		
	ion of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. T		•
	only a programming language but any text in a language generated by a given LL input grammar.		
BI-PJS.1	JavaScript Programming	KZ	4
	course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development		
•	tudents of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the	•	
rocommonaca ioi c	of study.		0000.01
BI-PJS.21	·	KZ	5
	JavaScript Programming		
	introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code develo	-	
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	Z	4
	This course is presented in Czech.		
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be wo	rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programm	ning, rule-based pr	ogramming,
	etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.		
BI-PNO.21	Practical Digital Design	KZ	5
_	rerview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the		_
<del>-</del>	on technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in		
	tools.	, ,	3
BI-PPA.21	Programming Paradigms	Z.ZK	5
	rith basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par	,	_
	figm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. Th		
	s and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstr		
	such as C++ and Java.	, , , , ,	33
BI-PRR.21	Project management	Z,ZK	5
	urse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, anal		_
	cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as	-	
	purce schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st		-
	nowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar		
3	also suitable for all those who will develop software or hardware in the form of team projects.	9	
BI-PRS.21	Practical Statistics	KZ	5
	e introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose mod		_
	gression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software	-	
Will Officeripade to	methods on data from real problems.	Trana wiii appiy i	no otaaloa
BI-PS2	Programming in shell 2	Z,ZK	4
	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi		
Students gain a ge	into shell and some other particular scripting languages and will get practical experience with shell script programming.	on, they gain a det	per maigni
DI DOLO4		7 71/	
BI-PSI.21	Computer Networks ces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local r	Z,ZK	5
	s will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw		
	s will be afficited by procentifials that introduce students into network programming and demonstrate the abilities of advanced network devices in the lab within the environment of the operating systems Linux at	•	Students
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BI-PST.21	Probability and Statistics	Z,ZK	5
Students will learn			appiv basic
	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T	hey will be able to	
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models of rando	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. The wariable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction nown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical	hey will be able to they will be able to	perform
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models of rando estimations of unk  BI-PYT.21  The aim of the co between philosophenables greater and BI-QAP  Course aims at giving are based, and algorython language  BI-QUA  This course introdevelopment and we	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. The provided in the statistical problems in informatics and computer science. Using the statistical induction in the statistical parameters from random sample characteristics. They will also be introduced to the methods for testing statistical the statistical dependence of two or more random variables.  Python Programming  urse is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data by of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the formation countries 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  and students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or contituting advantages and limitations of quantum computing. During tutorials students work in open-source software development. Showledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM might be an advantage. No previous knowledge of physics is assumed.  Quality Assurance  duces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will learn what the role of a tester is in the context of the students will be an advantage.	hey will be able to they will be able to hypotheses and do hypotheses and do hypotheses and hypothe	5 differences ook, which ned during  5 echnologies ch is based with Python  4 software rform a test

BI-SAP.21	Computer Structure and Architecture	Z,ZK	5
-	acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arith unication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proce	_	
11011101 y, 1/ C CONIII1	in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.	ooor to practically	ппротполнос
BI-SCE1	Computer Engineering Seminar I	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to		
	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teache	-	
irticies and other p	semester.	is. The topics are	new ioi eacii
BI-SCE2	Computer Engineering Seminar II	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to		
	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	•	
articles and other p	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teache semester.	rs. The topics are	new for each
BI-SEP	World Economy and Business	Z,ZK	4
This course is pre	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by c	omparing individu	al countries
· -	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as		
corruption and eco	nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of d readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	iscussions based	on individual
BI-SIP.21	Network Programming	Z	5
	fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level program	I	-
•	oted to designing communication protocols and their verification. The third part introduces the principles and applications of middlews	•	•
introduces basic	modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in coprogramming language environment.	mputer labs using	a chosen
BI-SKJ.21	Scripting Languages	Z,ZK	4
	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi		1 -
	into shell and some other particular scripting languages and will get practical experience with shell script programming.		
BI-SOJ	Machine Oriented Languages	Z,ZK	4
	rse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view li	=	
ina emoient coope	This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	ince to higher levi	oriariguages.
BI-SP1.21	Team Software Project 1	KZ	5
_	ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		
	nat teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teach		
project leader, regi	llarly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software art and finished in the BIE-SP2 course.	telact will be furth	er developed
BI-SP2.21	Team Software Project 2	KZ	5
	s-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result	of the BIE-SP1 co	ourse project.
	ollow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work the state of the second and the secon		people. The
BI-SPS.21	er, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects  Administration of Computer Networks and Services	Z,ZK	5
	rse is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrate	,	-
	. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by	-	
	with real network infrastructure.		
BI-SQL.1	Language SQL, advanced	KZ	4
	knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point		-
	exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan at		
	d. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle	•	_
	PostgreSQL.		
BI-SRC.21	Real-time systems	Z,ZK	5
	ne basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab ar		_
	course.		
BI-ST1	Network Technology 1	Z	3
The subject is or	ented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredite	d under the Cisco	Netacad -
DI CTO	CCNA1 - R&S Introduction to Networks.	7	
BI-ST2	Network Technology 2 This course is presented in Czech.	Z	3
BI-ST3	Network Technology 3	Z	3
	r enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during B	I	1
get further extend	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pred	ictability, extensio	n beyond a
DI CT 4	simple topology, security, etc.	7	2
BI-ST4 Students will furth	Network Technology 4 er 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
	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici	-	
beyond a simple	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely	y other type of net	work (Non
	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch	-	•
recoveries, and en	nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigati network running.	on ways while ma	maming the
	nother running.		

**BI-STO** Storage and Filesystems Z,ZK 4 The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and 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 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-TDA** Test driven architecture The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that 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** BI-TDP.21 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-TFX** TeX and Typography 4 This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the course focuses on typographic BI-TIS.21 Information Systems Z,ZK 5 The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success. At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. BI-TJV.21 Java Technology 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies 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 Ζ Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS2 Theoretical Seminar II 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-TS3 7 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar IV RI-TS4 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. User Interface Design 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 7 7K 5 The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.

**BI-ULI** Introduction to Linux Ζ 2 Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal) Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell Selected Applications of Combinatorics BI-VAK.21 The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BI-VDC.21 Virtualization and Data Centers Z,ZK The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses. **Embedded Systems** BI-VES.21 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. BI-VIZ.21 **Data Visualization** The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language. 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 BI-VPS.21 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 ΚZ 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 K7 Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. BI-7NF PHP Framework Nette - basics ΚZ 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-ZNS.21 Knowledge-based Systems Students will become familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intelligence to solve problems that require human judgment, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowledge-based systems to support decision-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutionary algorithms. Process engineering 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. Basics of System Control BI-ZRS.21 Z,ZK The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system

model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. 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 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 7 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 The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis. BI-ZUM.21 Artificial Intelligence Fundamentals Z,ZK Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course. **BI-ZWU** Introduction to Web and User Interfaces Z.ZK This course is presented in Czech. **BIE-CSI** Introduction to Computer Science Ζ 2 This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fields but interested in computer science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The goal of the class is to introduce and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level programming languages and tools are done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected, or even less than before. Differential equations **BIF-DIF** Z.ZK This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential solution methods like separation of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with methods like characteristic polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications. Finally, an introduction to partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. **BIE-EEC** English language external certificate 4 The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding the B2 level of the Common European Framework of Reference for Languages. BIE-IMA2 2 Introduction to Mathematics 2 Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Systems Engineering This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of operating systems for students to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the class, students are able to understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concurrency is, as opposed to parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. **BIE-ZUM** Artificial Intelligence Fundamentals Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well. FI-TOP Academic writing Ζ Publishing is an important and required part of research activity. It is not only about obtaining research results but also about applying them in the form of publication. Writing scientific publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the course, students will learn how to write a scientific article, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an article and reviewing someone else's article. The course will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Dates will be determined based on the availability of enrolled students. **Applied Functional Programming** This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming languages are on the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mastering this paradigm becomes a necessary competence of a software engineer: the theory and especially the practice.

NI-DDM Course focuses on	Distributed Data Mission	1/7	1
Course locuses on	Distributed Data Mining   state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands o	KZ	4
	mework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a	-	-
acia proceeding ne	approaches to parallelize other algorithms. The course is prezented in czech language.	20 oapas.c	, to proposi
NI-DSP	Database Systems in Practes	Z,ZK	4
- '	This course is presented in Czech.	,	1
NI-DZO	Digital Image Processing	Z,ZK	4
This course prese	ats a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms are comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms are comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms are comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms are comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms are comprehensive overview of the comprehensive of the comprehensive overview of the	orithms that are b	oth easy to
•	an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als		
	rocessing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR (		_
	abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conve id-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ad		
NI-IAM	Internet and Multimedia	Z.ZK	4
	e is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acqu	,	1
	ignals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical us	_	
audiovisual transm	issions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effe	ect of various com	ponents or
ne quality and later	cy of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the	scene up to the	presentation
	for audience.		
NI-LSM	Statistical Modelling Lab	KZ	5
	nted on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is punded in a single of methods and algorithms, and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		
valiable il ilolitiatio	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis	' <del>-</del>	properties
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
	gramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where it		
-	olex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills	=	
	n modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development ne		
-	ng object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of		
	ns of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvements of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvements.		
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science  mantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	Z,ZK	4
Mathematical se	Introduction to category theory.	model of lambda	calculus.
NI-OLI	Linux Drivers	Z.ZK	4
-	system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po	,	
	bility of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developmen		
COL	rse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica	I experience.	
NI-PDD	Data Preprocessing	Z,ZK	5
-	epare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data so		_
time series, etc., a	nd learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characterist	ics from images of	or from web
NI DOD	pages.		
NI-PSD	Public Services Design duce students to specifics of UX, Service design and development for public sector. We will look into the design and development pro	1/7	
	duce students to specifics of OA. Service design and development for public sector, we will look into the design and development pr	KZ	4
		ocess from the pe	erspective of
оцрро.о (аото а.	nd designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	ocess from the pe	erspective of
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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 <a href="http://bilakniha.cvut.cz/en/FF.html">http://bilakniha.cvut.cz/en/FF.html</a> Generated: day 2025-05-19, time 03:01.