

# Studijní plán

## Název plánu: Bachelor Specialization Computer Engineering, 2021

Sou část VUT (fakulta/ústav/další): Fakulta informačních technologií

Katedra:

Obor studia, garantovaný katedrou: Úvodní stránka

Garant oboru studia.:

Program studia: Informatics

Typ studia: Bakalářské prezenční

Předeepsané kredity: 155

Kredity z volitelných předmětů: 25

Kredity v rámci plánu celkem: 180

Poznámka k plánu: This version of the study plan is intended for students who have been enrolled for study from the academic year 2021/2022 into the full-time form of study of the bachelor's program. . Guarantor:

doc. Ing. Hana Kubátová, CSc., email: hana.kubatova@fit.cvut.cz

Název bloku: Povinné předměty programu

Minimální počet kreditů bloku: 110

Role bloku: PP

Kód skupiny: BIE-PP.21

Název skupiny: Compulsory Courses of Bachelor Study Program Informatics, version 2021

Podmínka kredity skupiny: V této skupině musíte získat 110 kreditů

Podmínka předmětů skupiny: V této skupině musíte absolvovat 21 předmětů

Kredity skupiny: 110

Poznámka ke skupině: If you plan to profile yourself in the specialization Information Security, Computer Networks and Internet, Computer Systems and Virtualization, or Software Engineering, enroll in the course BIE-PSI.21 in your 2nd semester of study. If you plan to profile yourself in the specialization Computer Engineering, or Computer Science, enroll in the course BI-PSI.21 in your 4th semester of study. - On the basis of the certificate of knowledge of English at the B2 level, which is stated in the conditions for admission to study, you can have the subject BIE-EEC recognized for 4 credits.

Kód	Název předmětu / Název skupiny předmětů (u skupiny předmětů seznam kód jejich členů) Využijící, autoři a garanti (gar.)	Zakonění	Kredity	Rozsah	Semestr	Role
BIE-AG1.21	<b>Algorithms and Graphs 1</b> Tomáš Valla, Michal Opler, Jiřina Scholtzová, Dušan Knop, Maria Saumell Mendiola <b>Dušan Knop</b> Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-AAG.21	<b>Automata and Grammars</b> Jan Holub <b>Jan Holub</b> Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-BPR.21	<b>Bachelor Project</b> <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z	1		Z,L	PP
BIE-BAP.21	<b>Bachelor Thesis</b> <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z	14		L,Z	PP
BIE-PSI.21	<b>Computer Networks</b> Yelena Trofimova, Michal Polák <b>Yelena Trofimova</b> Yelena Trofimova (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-SAP.21	<b>Computer Structures and Architectures</b> Petr Fišer <b>Petr Fišer</b> Petr Fišer (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BIE-KAB.21	<b>Cryptography and Security</b> Jiří Bůžek, Filip Kodýtek, Jaroslav Kříž, Róbert Lórencz, František Kovář, David Pokorný <b>Jiří Bůžek</b> Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BIE-DBS.21	<b>Database Systems</b> Josef Pavlíček, Otto Šleger, Martin Urbanec <b>Josef Pavlíček</b> Josef Pavlíček (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BIE-DML.21	<b>Discrete Mathematics and Logic</b> Eva Pernecká, Jitka Rybníková, Francesco Dolce <b>Eva Pernecká</b> Eva Pernecká (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-TDP.21	<b>Documentation and Presentation</b> Dana Vyníkarová <b>Dana Vyníkarová</b> Dana Vyníkarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BIE-EEC	<b>English language external certificate</b> Zdeněk Muzikář <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z	4	2D	L	PP
BIE-LA1.21	<b>Linear Algebra 1</b> Marzieh Forough <b>Karel Klouda</b> Marzieh Forough (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

BIE-MA1.21	<b>Mathematical Analysis 1</b> <i>Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)</i>	Z,ZK	5	2P+1R+1C	L	PP
BIE-MA2.21	<b>Mathematical Analysis 2</b> <i>Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)</i>	Z,ZK	6	3P+2C	Z	PP
BIE-OSY.21	<b>Operating Systems</b> <i>Michal Štepanovský, Jan Trdlík, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)</i>	Z,ZK	5	2P+1R+1L	L	PP
BIE-PST.21	<b>Probability and Statistics</b> <i>Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)</i>	Z,ZK	5	2P+2C	Z	PP
BIE-PA1.21	<b>Programming and Algorithmics 1</b> <i>Radek Hušek, Jan Trávník, Ladislav Vagner, Josef Vogel Jan Trávník Jan Trávník (Gar.)</i>	Z,ZK	7	2P+2R+2C	Z	PP
BIE-PA2.21	<b>Programming and Algorithmics 2</b> <i>Radek Hušek, Jan Trávník, Ladislav Vagner, Josef Vogel Jan Trávník Jan Trávník (Gar.)</i>	Z,ZK	7	2P+1R+2C	L	PP
BIE-GIT.21	<b>SW Development Technologies</b> <i>Petr Pulc Petr Pulc Petr Pulc (Gar.)</i>	Z	3	2P	Z	PP
BIE-TZP.21	<b>Technological Fundamentals of Computers</b> <i>Kateřina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)</i>	Z,ZK	5	2P+2C	Z	PP
BIE-UOS.21	<b>Unix-like Operating Systems</b> <i>Jan Trdlík, Jakub Žitný, Zdeněk Muziká Zdeněk Muziká Zdeněk Muziká (Gar.)</i>	KZ	5	2P+2C	Z	PP

### Charakteristiky předmětů této skupiny studijního plánu: Kód=BIE-PP.21 Název=Compulsory Courses of Bachelor Study Program Informatics, version 2021

BIE-AG1.21	Algorithms and Graphs 1	Z,ZK	5	The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.		
BIE-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, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.		
BIE-BPR.21	Bachelor Project	Z	1	At the beginning of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that student will perform during the semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.		
BIE-BAP.21	Bachelor Thesis	Z	14			
BIE-PSI.21	Computer Networks	Z,ZK	5	The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local 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.		
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5	Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools.		
BIE-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. Students are expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.		
BIE-DBS.21	Database Systems	Z,ZK	5	Students get acquainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (including integrity constraints) using a conceptual model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its theoretical basis - relational database model. They will get acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction processing and control of parallel user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database models.		
BIE-DML.21	Discrete Mathematics and Logic	Z,ZK	5	Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics.		
BIE-TDP.21	Documentation and Presentation	KZ	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 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.		
BIE-EEC	English language external certificate	Z	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-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.		

BIE-MA1.21	Mathematical Analysis 1	Z,ZK	5
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms.			
BIE-MA2.21	Mathematical Analysis 2	Z,ZK	6
The course completes the theme of analysis of real functions of a real variable initiated in BIE-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.			
BIE-OSY.21	Operating Systems	Z,ZK	5
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.			
BIE-PST.21	Probability and Statistics	Z,ZK	5
Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. 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.			
BIE-PA1.21	Programming and Algorithmics 1	Z,ZK	7
Students learn to construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structured), expressions, statements, and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundamental algorithms for searching, sorting, and manipulating linked lists and trees.			
BIE-PA2.21	Programming and Algorithmics 2	Z,ZK	7
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).			
BIE-GIT.21	SW Development Technologies	Z	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.			
BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.			
BIE-UOS.21	Unix-like Operating Systems	KZ	5
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.			

Název bloku: Povinné p edm ty specializace

Minimální počet kredit bloku: 40

Role bloku: PS

Kód skupiny: BIE-PI-PS.21

Název skupiny: Compulsory Courses of Bachelor Specialization Computer Engineering, version 2021

Podmínka kredity skupiny: V této skupin musíte získat 40 kredit

Podmínka p edm ty skupiny: V této skupin musíte absolvovat 6 p edm t

Kredity skupiny: 40

Poznámka ke skupině:

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejich len ) Vyu uující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-APS.21	<b>Architectures of Computer Systems</b> Michal Štepanovský, Pavel Tvrđík <b>Pavel Tvrđík</b> Pavel Tvrđík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-ZRS.21	<b>Basics of System Control</b> Kate ina Hyniová <b>Kate ina Hyniová</b> Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z,L	PS
BIE-JPO.21	<b>Computer Units</b> Pavel Kubalík <b>Pavel Kubalík</b> Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-VES.21	<b>Embedded Systems</b> Miroslav Skrbek <b>Miroslav Skrbek</b> Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	PS
BIE-LA2.21	<b>Linear Algebra 2</b> Karel Klouda, Marzieh Forough <b>Karel Klouda</b> Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	PS
BIE-MPP.21	<b>Methods of interfacing peripheral devices</b> Miroslav Skrbek <b>Miroslav Skrbek</b> Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-PNO.21	<b>Practical Digital Design</b> <b>Martin Novotný</b>	KZ	5	2P+2C	Z	PS

BIE-SRC.21	<b>Real-time systems</b> <i>Hana Kubátová, Jiří Vyskočil Hana Kubátová Hana Kubátová (Gar.)</i>	Z,ZK	5	2P+2C	Z	PS
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**Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-PS.21 Název=Compulsory Courses of Bachelor Specialization Computer Engineering, version 2021**

BIE-APS.21	Architectures of Computer Systems	Z,ZK	5	Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such systems.		
BIE-ZRS.21	Basics of System Control	Z,ZK	5	The course gives an introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It covers basic knowledge of the feedback control of linear dynamical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear dynamic systems analysis, and design and verification of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability of control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digital controllers.		
BIE-JPO.21	Computer Units	Z,ZK	5	Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA).		
BIE-VES.21	Embedded Systems	Z,ZK	5	Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
BIE-LA2.21	Linear Algebra 2	Z,ZK	5	Students will broaden their knowledge gained in the BIE-LA1 introductory course, where only vectors in the form of n-tuples of numbers were considered. Here we will introduce vector spaces in a general abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear algebra, geometry, and computer graphics. The other main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The issues of numerical linear algebra will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be presented.		
BIE-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5	The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices.		
BIE-PNO.21	Practical Digital Design	KZ	5	Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design tools.		
BIE-SRC.21	Real-time systems	Z,ZK	5	Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in department specialized 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 and FPGAs.		

Název bloku: Povinn volitelné p edm ty

Minimální počet kredit bloku: 5

Role bloku: PV

Kód skupiny: BIE-PI-PV.21

Název skupiny: Compulsory elective Courses of Specialization Computer Engineering, version 2021

Podmínka kredity skupiny: V této skupin musíte získat alespo 5 kredit (maximáln 15)

Podmínka p edm ty skupiny: V této skupin musíte absolvovat alespo 1 p edm t ( maximáln 3)

Kredity skupiny: 5

Poznámka ke skupině:

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) <i>Vyu uující, auto i a garanti (gar.)</i>	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-ZUM.21	<b>Artificial Intelligence Fundamentals</b> <i>Pavel Surynek Pavel Surynek Pavel Surynek (Gar.)</i>	Z,ZK	5	2P+2C	L	PV
BIE-PJP	<b>Programming Languages and Compilers</b> <i>Jan Janoušek</i>	Z,ZK	5	2P+1C	L	PV
BIE-BEK	<b>Secure Code</b> <i>Róbert Lórencz</i>	Z,ZK	5	2P+2C	L	PV

**Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-PV.21 Název=Compulsory elective Courses of Specialization Computer Engineering, version 2021**

BIE-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5	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.		
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BIE-PJP	Programming Languages and Compilers	Z,ZK	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.			
BIE-BEK	Secure Code	Z,ZK	5
Studenti se naučí posuzovat a zohledňovat bezpečnostní rizika při návrhu svého kódu a řešení v běžné inženýrské praxi. Od teorie modelování bezpečnostních rizik přistoupí k praxi, ve které si vyzkouší běžný program pod nižšími oprávněními a jak tato oprávnění stanovovat, protože ne každý program musí nutně být s administrátorskými oprávněními. Budou také prakticky demonstrována rizika spojená s použitím bufferu. Dále se studenti budou krátce věnovat zabezpečení dat a jak toto zabezpečení souvisí s databázovými systémy a webem. V závěru se budou věnovat útokům typu DoS (Denial of Service) a obraně proti nim.			

Název bloku: Volitelné předměty

Minimální počet kreditů bloku: 0

Role bloku: V

Kód skupiny: BIE-V.2021

Název skupiny: Purely Elective Bachelor Courses, Version 2021 till 2024/25

Podmínka kredity skupiny:

Podmínka předmětů skupiny:

Kredity skupiny: 0

Poznámka ke skupině:

Kód	Název předmětu / Název skupiny předmětů (u skupiny předmětů seznam kód jejich členů) Využijící, autoři a garanté (gar.)	Zakonění	Kredity	Rozsah	Semestr	Role
BIE-ZUM	<b>Artificial Intelligence Fundamentals</b> Pavel Surynek	Z,ZK	4	2P+2C	L	V
BIE-ZRS	<b>Basics of System Control</b> Kateřina Hyniová	Z,ZK	4	2P+2C	L	V
BIE-CCN	<b>Compiler Construction</b> Christoph Kirsch Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BIE-SCE1	<b>Computer Engineering Seminar I</b> Hana Kubátová, Miroslav Skrbek Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
BIE-SCE2	<b>Computer Engineering Seminar II</b> Hana Kubátová, Jiří Vyskočil Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	<b>Czech Language for Foreigners</b> Tomáš Houdek, Markéta Hofmannová, Ivana Vondráková, Petra Korřová Zdeněk Muzikář Zdeněk Muzikář (Gar.)	KZ	2	4C	Z,L	V
BIE-CZ1.21	<b>Czech Language for Foreigners II</b> Tomáš Houdek, Ivana Vondráková, Petra Korřová Zdeněk Muzikář Zdeněk Muzikář (Gar.)	KZ	2	4C	Z,L	V
UKCJP	<b>Vešтина pro pokročilé</b> Tomáš Houdek, Jakub Šenovský, Jakub Šolc, Adam Vostárek Zdeněk Muzikář Zdeněk Muzikář (Gar.)	Z,ZK	2	2BP+2BC	Z,L	V
BIE-DIF	<b>Differential equations</b> Antonella Marchesiello, Ondřej Bouchala, Jan Valdman Tomáš Kalvoda Ondřej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-EPR	<b>Economic project</b> Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	V
BIE-FTR.1	<b>Financial Markets</b> Pavla Vozárová	Z,ZK	5	2P+2C	L	V
BIE-HAS	<b>Human Factors in Cryptography and Security</b> Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
BIE-CSI	<b>Introduction to Computer Science</b> Christoph Kirsch Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
BIE-EHD	<b>Introduction to European Economic History</b> Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
BIE-IMA	<b>Introduction to Mathematics</b> Karel Klouda	Z	4	3C	Z	V
BIE-IMA2	<b>Introduction to Mathematics 2</b> Karel Klouda	Z	2	1C	Z	V
BIE-ST1	<b>Network Technology 1</b> Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BIE-OOP	<b>Object-Oriented Programming</b> Filip Kikava	Z,ZK	4	2P+2C	Z	V
BIE-PKM	<b>Preparatory Mathematics</b> Jitka Rybníková Tomáš Kalvoda (Gar.)	Z	4		Z	V
BIE-PJV	<b>Programming in Java</b> Jan Blížnička Jan Blížnička Jan Blížnička (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PS2	<b>Programming in shell 2</b> Lukáš Bařinka	Z,ZK	4	2P+2C	L	V

BIE-PRR.21	<b>Project management</b> <i>David Pešek David Pešek David Pešek (Gar.)</i>	Z,ZK	5	2P+2C	Z,L	v
BIE-SKJ.21	<b>Scripting Languages</b> <i>Jan Žárek, Lukáš Bařinka Lukáš Bařinka Jan Žárek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BIE-VAK.21	<b>Selected Combinatorics Applications</b> <i>Michal Opler, Dušan Knop Michal Opler Michal Opler (Gar.)</i>	Z	3	2R	L	v
BIE-VMM	<b>Selected Mathematical Methods</b> <i>Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-SCE1	<b>Seminář po ita ového inženýrství I</b> <i>Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)</i>	Z	4	2C	L,Z	v
BIE-SEG	<b>Systems Engineering</b> <i>Christoph Kirsch Christoph Kirsch Christoph Kirsch (Gar.)</i>	Z	0	2C	Z	v
TVV	<b>T lesná výchova</b>	Z	0	0+2	Z,L	v
TVV0	<b>T lesná výchova 0</b>	Z	0	0+2	Z,L	v
TV2K1	<b>T lesná výchova 2</b>	Z	1		L,Z	v
TVKLV	<b>T lovýchovný kurz</b>	Z	0	7dní	L	v
BIE-TUR.21	<b>User Interface Design</b> <i>Jan Schmidt Jan Schmidt Jan Schmidt (Gar.)</i>	Z,ZK	5	2P+2C	L	v
BIE-VR1.21	<b>Virtual reality I</b> <i>Petr Klán Petr Klán Petr Klán (Gar.)</i>	KZ	4	2P+2C	L,Z	v
BIE-ADW.1	<b>Windows Administration</b> <i>Jiří Kašpar, Miroslav Prágl Miroslav Prágl Miroslav Prágl (Gar.)</i>	Z,ZK	4	2P+1C	Z	v
BIE-SEP	<b>World Economy and Business</b> <i>Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BIE-3DT.1	<b>3D Printing</b> <i>Marek Žehra</i>	KZ	4	3C	L	v

**Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-V.2021 Název=Purely Elective Bachelor Courses, Version 2021 till 2024/25**

BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4			
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the 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.						
BIE-ZRS	Basics of System Control	Z,ZK	4			
Volitelný p edm t základy ízení systém je ur en pro všechny zájemce o aplikovanou informatiku v bakalářském studiu. Alespo p ehledové znalosti oboru automatického ízení budou pro naše absolventy jist konkuren ní výhodou a zhodnotí je bezesporu v pr myslové praxi. Studenti získají znalosti v dynamicky se rozvíjejícím oboru s velkou budoucností. Zam íme se zejména na ízení inženýrských a fyzikálních systém . Poskytneme vám základní informace z oblasti zp novazebního ízení lineárních dynamických jednorozm rových systém . Seznámíme vás s metodami vytvá ení popisu a modelu systém , základní analýzou lineárních dynamických systém a návrhem a ov ením jednoduchých zp novazebních PID, PSD a fuzzy regulátor . Pozornost je v nována rovn ž sníma m a ak ním len m v regula ních obvodech, otázkám stability regula ních obvod , jednorázovému a pr b žnému nastavování parametr regulátoru a n kterým aspekt m pr myslových realizací spojitých a íslicových regulátor . Jednotlivá témata p ednášek jsou provázena množstvím užite ných p íklad a praktických pr myslových realizací.						
BIE-CCN	Compiler Construction	Z,ZK	5			
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class.						
BIE-SCE1	Computer Engineering Seminar I	Z	4			
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.						
BIE-SCE2	Computer Engineering Seminar II	Z	4			
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.						
BIE-CZ0	Czech Language for Foreigners	KZ	2			
Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.						
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2			
The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The course further expands the basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Republic.						
UKCJP	eština pro pokro ílé	Z,ZK	2			
Kurz pokro ílé eštiny pro ukrajinské studenty, kte í mají status uprchlíka. Zkouška potvrdí znalost eštiny na úrovni B2 s platností pro VUT.						
BIE-DIF	Differential equations	Z,ZK	5			
This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to 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-EPR	Economic project	Z	1			
This course is an extension of the course Introduction to European Economic History (BIE-EHD).						

<b>BIE-FTR.1</b>	<b>Financial Markets</b>	Z,ZK	5
Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.			
<b>BIE-HAS</b>	<b>Human Factors in Cryptography and Security</b>	Z,ZK	5
P ed m t je ur en student m, které zajímá nejen matematická a technická stránka v ci, ale i p emýšlení nad tím, jestli výsledný produkt bude použitelný pro lidi (od t ch, kte í implementují šířry po uživatele aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v kontextu kybernetické bezpe nosti zam ené na lov ka.			
<b>BIE-CSI</b>	<b>Introduction to Computer Science</b>	Z	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.			
<b>BIE-EHD</b>	<b>Introduction to European Economic History</b>	Z,ZK	3
The course introduces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key historical periods. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. From the large economic area of the Roman Empire to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lectures and discussions.			
<b>BIE-IMA</b>	<b>Introduction to Mathematics</b>	Z	4
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.			
<b>BIE-IMA2</b>	<b>Introduction to Mathematics 2</b>	Z	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.			
<b>BIE-ST1</b>	<b>Network Technology 1</b>	Z	3
P ed m t je ur en na získání základních znalostí z oblasti po íta ových sítí a praktických zkušeností se sí ovými technologiemi. P ed m t odpovídá látce kurikula Cisco Netacad programu - CCNA1 - R&S Introduction to Networks.			
<b>BIE-OOP</b>	<b>Object-Oriented Programming</b>	Z,ZK	4
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 we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software development including testing, error handling, refactoring and design patterns.			
<b>BIE-PKM</b>	<b>Preparatory Mathematics</b>	Z	4
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.			
<b>BIE-PJV</b>	<b>Programming in Java</b>	Z,ZK	4
The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java language the fundamental APIs will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.			
<b>BIE-PS2</b>	<b>Programming in shell 2</b>	Z,ZK	4
Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: We are ready do adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice.			
<b>BIE-PRR.21</b>	<b>Project management</b>	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, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects.			
<b>BIE-SKJ.21</b>	<b>Scripting Languages</b>	Z,ZK	4
Join us on a tour into the world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry standards, as well as a couple of other standard text processing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. We will provide a general overview of scripting languages and introduction into their pros and cons and students get practical experience with shell script programming. We will touch also ROFF, PerlDoc, and even TeX to get some insight into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you advanced programming techniques and tricks that get overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the scripting world. Lukáš is a renowned lecturer in advanced shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whose code contributes to safe and streamline operations of cloud service datacenters around the globe.			
<b>BIE-VAK.21</b>	<b>Selected Combinatorics Applications</b>	Z	3
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.			
<b>BIE-VMM</b>	<b>Selected Mathematical Methods</b>	Z,ZK	4
The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and their properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.			

BI-SCE1	Seminář po ita ového inženýrství I	Z	4
Seminář po ita ového inženýrství je výběrový předmět pro studenty, kteří se chtějí zabývat hlouběji tématy číslicového návrhu, spolehlivosti a odolnosti proti poruchám a útokům. Ke studentům se v rámci předmětu připouje individuálně a každý student i skupinka studentů eší nějaké zajímavé aktuální téma s vybraným školitelem. Součástí předmětu je práce s vdeckými články a jinou odbornou literaturou a/nebo práce v laboratorních K N. Kapacita předmětu je omezena možnostmi učitelů seminářů. Probíraná témata jsou pro každý semestr nová.			
BIE-SEG	Systems Engineering	Z	0
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic 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.			
TVV	T lesná výchova	Z	0
TVV0	T lesná výchova 0	Z	0
TV2K1	T lesná výchova 2	Z	1
TVKLV	T lovýchovný kurz	Z	0
BIE-TUR.21	User Interface Design	Z,ZK	5
Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them.			
BIE-VR1.21	Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The course focuses on the ways of creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities.			
BIE-ADW.1	Windows Administration	Z,ZK	4
Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.			
BIE-SEP	World Economy and Business	Z,ZK	4
The course introduces students of technical universities to international business. It does that predominantly by comparing individual countries and key regions of the world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individual readings.			
BIE-3DT.1	3D Printing	KZ	4
Students learn to design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects, prepare for printing and print in 3D.			

### Seznam předmětů tohoto přechodu:

Kód	Název předmětu	Zakonění	Kredity
BI-SCE1	Seminář po ita ového inženýrství I	Z	4
Seminář po ita ového inženýrství je výběrový předmět pro studenty, kteří se chtějí zabývat hlouběji tématy číslicového návrhu, spolehlivosti a odolnosti proti poruchám a útokům. Ke studentům se v rámci předmětu připouje individuálně a každý student i skupinka studentů eší nějaké zajímavé aktuální téma s vybraným školitelem. Součástí předmětu je práce s vdeckými články a jinou odbornou literaturou a/nebo práce v laboratorních K N. Kapacita předmětu je omezena možnostmi učitelů seminářů. Probíraná témata jsou pro každý semestr nová.			
BIE-3DT.1	3D Printing	KZ	4
Students learn to design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects, prepare for printing and print in 3D.			
BIE-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, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.			
BIE-ADW.1	Windows Administration	Z,ZK	4
Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.			
BIE-AG1.21	Algorithms and Graphs 1	Z,ZK	5
The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.			
BIE-APS.21	Architectures of Computer Systems	Z,ZK	5
Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such systems.			
BIE-BAP.21	Bachelor Thesis	Z	14
BIE-BEK	Secure Code	Z,ZK	5
Studenti se naučí posuzovat a zohledňovat bezpečnostní rizika při návrhu svého kódu a řešení v běžné inženýrské praxi. Od teorie modelování bezpečnostních rizik přistoupí k praxi, ve které si vyzkouší běh programů pod nižšími oprávněními a jak tato oprávnění stanovovat, protože ne každý program musí nutně být s administrátorskými oprávněními. Budou také			



prakticky demonstrována rizika spojená s p ete ením bufferu. Dále se studenti budou krátce v novat zabezpe ení dat a jak toto zabezpe ení souvisí s databázovými systémy a webem. V záv ru se budou v novat útok m typu DoS (Denial of Service) a obran proti nim.

BIE-BPR.21	<b>Bachelor Project</b>	Z	1
At the beginning of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that student will perform during the semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.			
BIE-CCN	<b>Compiler Construction</b>	Z,ZK	5
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class.			
BIE-CSI	<b>Introduction to Computer Science</b>	Z	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.			
BIE-CZ0	<b>Czech Language for Foreigners</b>	KZ	2
Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.			
BIE-CZ1.21	<b>Czech Language for Foreigners II</b>	KZ	2
The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The course further expands the basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Republic.			
BIE-DBS.21	<b>Database Systems</b>	Z,ZK	5
Students get acquainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (including integrity constraints) using a conceptual model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its theoretical basis - relational database model. They will get acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction processing and control of parallel user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database models.			
BIE-DIF	<b>Differential equations</b>	Z,ZK	5
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-DML.21	<b>Discrete Mathematics and Logic</b>	Z,ZK	5
Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics.			
BIE-EEC	<b>English language external certificate</b>	Z	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-EHD	<b>Introduction to European Economic History</b>	Z,ZK	3
The course introduces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key historical periods. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. From the large economic area of the Roman Empire to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lectures and discussions.			
BIE-EPR	<b>Economic project</b>	Z	1
This course is an extension of the course Introduction to European Economic History (BIE-EHD).			
BIE-FTR.1	<b>Financial Markets</b>	Z,ZK	5
Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.			
BIE-GIT.21	<b>SW Development Technologies</b>	Z	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.			
BIE-HAS	<b>Human Factors in Cryptography and Security</b>	Z,ZK	5
P ed m t je ur en student m, které zajímá nejen matematická a technická stránka v ci, ale i p emyšlení nad tím, jestli výsledný produkt bude použitelný pro lidi (od t ch, kte í implementují šifry po uživatele aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v kontextu kybernetické bezpe nosti zam ené na lov ka.			
BIE-IMA	<b>Introduction to Mathematics</b>	Z	4
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.			
BIE-IMA2	<b>Introduction to Mathematics 2</b>	Z	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.			
BIE-JPO.21	<b>Computer Units</b>	Z,ZK	5
Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA).			

BIE-KAB.21	<b>Cryptography and Security</b> 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. Students are expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.	Z,ZK	5
BIE-LA1.21	<b>Linear Algebra 1</b> 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 use 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.	Z,ZK	5
BIE-LA2.21	<b>Linear Algebra 2</b> Students will broaden their knowledge gained in the BIE-LA1 introductory course, where only vectors in the form of n-tuples of numbers were considered. Here we will introduce vector spaces in a general abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear algebra, geometry, and computer graphics. The other main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The issues of numerical linear algebra will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be presented.	Z,ZK	5
BIE-MA1.21	<b>Mathematical Analysis 1</b> 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.	Z,ZK	5
BIE-MA2.21	<b>Mathematical Analysis 2</b> The course completes the theme of analysis of real functions of a real variable initiated in BIE-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.	Z,ZK	6
BIE-MPP21	<b>Methods of interfacing peripheral devices</b> 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.	Z,ZK	5
BIE-OOP	<b>Object-Oriented Programming</b> 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 we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software development including testing, error handling, refactoring and design patterns.	Z,ZK	4
BIE-OSY.21	<b>Operating Systems</b> 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.	Z,ZK	5
BIE-PA1.21	<b>Programming and Algorithmics 1</b> Students learn to construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structured), expressions, statements, and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundamental algorithms for searching, sorting, and manipulating linked lists and trees.	Z,ZK	7
BIE-PA2.21	<b>Programming and Algorithmics 2</b> 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).	Z,ZK	7
BIE-PJP	<b>Programming Languages and Compilers</b> Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.	Z,ZK	5
BIE-PJV	<b>Programming in Java</b> The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java language the fundamental APIs will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.	Z,ZK	4
BIE-PKM	<b>Preparatory Mathematics</b> The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.	Z	4
BIE-PNO.21	<b>Practical Digital Design</b> Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design tools.	KZ	5
BIE-PRR.21	<b>Project management</b> The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects.	Z,ZK	5
BIE-PS2	<b>Programming in shell 2</b> Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: We are ready to adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice.	Z,ZK	4

BIE-PSI.21	Computer Networks	Z,ZK	5
The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local 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.			
BIE-PST.21	Probability and Statistics	Z,ZK	5
Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. 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.			
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5
Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools.			
BIE-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BIE-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BIE-SEG	Systems Engineering	Z	0
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic 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-SEP	World Economy and Business	Z,ZK	4
The course introduces students of technical universities to international business. It does that predominantly by comparing individual countries and key regions of the world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individual readings.			
BIE-SKJ.21	Scripting Languages	Z,ZK	4
Join us on a tour into the world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry standards, as well as a couple of other standard text processing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. We will provide a general overview of scripting languages and introduction into their pros and cons and students get practical experience with shell script programming. We will touch also ROFF, PerlDoc, and even TeX to get some insight into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you advanced programming techniques and tricks that get overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the scripting world. Lukáš is a renowned lecturer in advanced shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whose code contributes to safe and streamline operations of cloud service datacenters around the globe.			
BIE-SRC.21	Real-time systems	Z,ZK	5
Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in department specialized 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 and FPGAs..			
BIE-ST1	Network Technology 1	Z	3
P edm t je zam en na získání základních znalostí z oblasti počítačových sítí a praktických zkušeností se síťovými technologiemi. P edm t odpovídá látce kurikula Cisco Netacad programu - CCNA1 - R&S Introduction to Networks.			
BIE-TDP.21	Documentation and Presentation	KZ	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 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.			
BIE-TUR.21	User Interface Design	Z,ZK	5
Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them.			
BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.			
BIE-UOS.21	Unix-like Operating Systems	KZ	5
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.			
BIE-VAK.21	Selected Combinatorics Applications	Z	3
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.			

BIE-VES.21	Embedded Systems	Z,ZK	5
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.			
BIE-VMM	Selected Mathematical Methods	Z,ZK	4
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.			
BIE-VR1.21	Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The course focuses on the ways of creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities.			
BIE-ZRS	Basics of System Control	Z,ZK	4
Volitelný předmět základy řízení systémů je určen pro všechny zájemce o aplikovanou informatiku v bakalářském studiu. Alespoň základní znalosti oboru automatického řízení budou pro naše absolventy jistě konkurenční výhodou a zhodnotí je bezesporu v praxi. Studenti získají znalosti v dynamicky se rozvíjícím oboru s velkou budoucností. Zaměřme se zejména na řízení inženýrských a fyzikálních systémů. Poskytneme vám základní informace z oblasti zprůměrovaného řízení lineárních dynamických jednorozměrových systémů. Seznámíme vás s metodami vytváření popisu a modelu systémů, základní analýzou lineárních dynamických systémů a návrhem a ověřením jednoduchých zprůměrovaných PID, PSD a fuzzy regulátorů. Pozornost je věnována rovněž snímáním a akčním členům v regulačních obvodech, otázkám stability regulačních obvodů, jednorázovému a průběžnému nastavování parametrů regulátorů a některým aspektům praxi realizací spojitých a diskrétních regulátorů. Jednotlivá témata popsaná jsou provázena množstvím užitečných příkladů a praktických praxi realizací.			
BIE-ZRS.21	Basics of System Control	Z,ZK	5
The course gives an introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It covers basic knowledge of the feedback control of linear dynamical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear dynamic systems analysis, and design and verification of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability of control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digital controllers.			
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the 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.			
BIE-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
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.			
TV2K1	T lesná výchova 2	Z	1
TVKLV	T lovýchovný kurz	Z	0
TVV	T lesná výchova	Z	0
TVV0	T lesná výchova 0	Z	0
UKCJP	ěština pro pokročilé	Z,ZK	2
Kurz pokročilé češtiny pro ukrajinské studenty, kteří mají status uprchlíka. Zkouška potvrdí znalost češtiny na úrovni B2 s platností pro VUT.			

Aktualizace výše uvedených informací naleznete na adrese <http://bilakniha.cvut.cz/cs/FF.html>

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