## Studijní plán

# Název plánu: Bachelor Specialization, Computer Engineering, Version 2024

Sou ást VUT (fakulta/ústav/další): Fakulta informa ních technologií Katedra: Obor studia, garantovaný katedrou: Úvodní stránka Garant oboru studia.: **Program studia: Informatics** Typ studia: Bakalá ské prezen ní P edepsané kredity: 155 Kredity z volitelných p edm t : 25 Kredity v rámci plánu celkem: 180 Poznámka k plánu: This version of the study plan is intended for the years that were accepted to study from the academic year 2024/2025 to the full-time form of study of the Bachelor's programme. Guarantor: doc. Ing. Hana Kubátová CSc., email: hana.kubatova@fit.cvut.cz Název bloku: Povinné p edm ty programu Minimální po et kredit 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 skupin musíte získat 110 kredit Podmínka p edm ty skupiny: V této skupin musíte absolvovat 21 p edm t Kredity skupiny: 110 Poznámka ke 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 skupině: 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. Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) Kód Zakon ení Kredity Rozsah Semestr Role Vyu ující, auto i a garanti (gar.) Algorithms and Graphs 1 Tomáš Valla, Michal Opler, Ji ina Scholtzová, Dušan Knop, Maria Saumell Mendiola **Dušan Knop** Dušan Knop (Gar.) BIE-AG1.21 Z,ZK 5 2P+2C Ζ PP Automata and Grammars **BIE-AAG.21** 5 2P+2C Ζ Z,ZK PP Jan Holub **Jan <u>Holub</u> J**an Holub (Gar.) **Bachelor Project** Ζ **BIE-BPR.21** 1 Z,L PP Zden k Muziká Zden k Muziká (Gar.) **Bachelor Thesis BIE-BAP.21** Ζ 14 L,Z PP Zden k Muziká Zden k Muziká Zden k Muziká (Gar.) **Computer Networks BIE-PSI.21** Z,ZK 5 2P+1R+1C L PP Yelena Trofimova, Michal Polák Yelena Trofimova Yelena Trofimova (Gar.) Computer Structures and Architectu

BIE-SAP.21	Computer Structures and Architectures Petr Fišer, Hana Kubátová Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BIE-KAB.21	Cryptography and Security Ji í Bu ek, Martin Jure ek, Filip Kodýtek, Josef Kokeš, Jaroslav K íž, Róbert Lórencz, Ivana Trummová, František Ková, David Pokorný <b>Ji í Bu ek</b> Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BIE-DBS.21	Database Systems Josef Pavlí ek, Otto Šleger, Martin Urbanec Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BIE-DML.21	<b>Discrete Mathematics and Logic</b> Eva Pernecká, Jitka Rybní ková, Francesco Dolce <b>Eva Pernecká</b> Eva Pernecká (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-TDP.21	Documentation and Presentation Dana Vynikarová Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PP
BIE-LA1.21	Linear Algebra 1 Marzieh Forough Karel Klouda Marzieh Forough (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

Mathematical Analysis 1 Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
Mathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)	Z,ZK	6	3P+2C	Z	PP
<b>Operating Systems</b> Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík <b>Pavel Tvrdík</b> Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
Probability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)	Z,ZK	5	2P+2C	Z	PP
Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
SW Development Technologies Petr Pulc Petr Pulc (Gar.)	Z	3	2P	Z	PP
Technological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
<b>Unix-like Operating Systems</b> Jan Trdli ka, Jakub Žitný, Zden k Muziká <b>Zden k Muziká</b> Zden k Muziká (Gar.)	КZ	5	2P+2C	Z	PP
	Antonella Marchesiello <b>Ťomáš Kalvoda</b> Tomáš Kalvoda (Gar.) Mathematical Analysis 2 Antonella Marchesiello <b>Tomáš Kalvoda</b> Antonella Marchesiello (Gar.) <b>Operating Systems</b> Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík <b>Pavel Tvrdík</b> Pavel Tvrdík (Gar.) <b>Probability and Statistics</b> Francesco Dolce <b>Pavel Hrabák</b> Francesco Dolce (Gar.) <b>Programming and Algorithmics 1</b> Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel <b>Jan Trávní ek</b> Jan Trávní ek (Gar.) <b>Programming and Algorithmics 2</b> Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel <b>Jan Trávní ek</b> Jan Trávní ek (Gar.) <b>SW Development Technologies</b> Petr Pulc Petr Pulc (Gar.) <b>Technological Fundamentals of Computers</b> Kate ina Hyniová, Martin Novotný, Matúš Olekšák <b>Martin Novotný</b> Martin Novotný (Gar.) <b>Unix-like Operating Systems</b> Jan Trdli ka, Jakub Žitný, Zden k Muziká <b>Zden k Muziká</b> Zden k Muziká	Antonella Marchesiello Ťomáš Kalvoda Tomáš Kalvoda (Gar.)       Z,ZK         Mathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)       Z,ZK         Operating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík       Z,ZK         Probability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)       Z,ZK         Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)       Z,ZK         Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)       Z,ZK         SW Development Technologies Petr Pulc Petr Pulc (Gar.)       Z         Technological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)       Z,ZK         Unix-like Operating Systems Jan Trdli ka, Jakub Žitný, Zden k Muziká Zden k Muziká Zden k Muziká       KZ	Antonella Marchesiello <b>Ťomáš Kalvoda</b> Tomáš Kalvoda (Gar.)Z,ZKSMathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)Z,ZK6Operating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)Z,ZK5Probability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)Z,ZK5Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)Z,ZK7Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek (Gar.)Z,ZK7SW Development Technologies Petr Pulc Petr Pulc (Gar.)Z3Technological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)Z,ZK5Unix-like Operating Systems Jan Trdli ka, Jakub Žitný, Zden k Muziká Zden k Muziká Zden k MuzikáKZ5	Antonella MarchesielloTomáš Kalvoda Tomáš Kalvoda (Gar.)Z,ZKSZ HINHICMathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)Z,ZK63P+2COperating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel TvrdíkZ,ZK52P+1R+1LProbability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)Z,ZK52P+2CProgramming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ekZ,ZK72P+2R+2CProgramming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ekZ,ZK72P+1R+2CSW Development Technologies Petr Pulc Petr Pulc (Gar.)Z32PTechnological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)Z,ZK52P+2CUnix-like Operating Systems Jan Trdli ka, Jakub Žitný, Zden k Muziká Zden k Muziká Zden k MuzikáKZ52P+2C	Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)Z,ZKSZ + HK+ICLMathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)Z,ZK63P+2CZOperating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel TvrdíkZ,ZK52P+1R+1LLProbability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)Z,ZK52P+2CZProgramming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)Z,ZK72P+2R+2CZProgramming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)Z,ZK72P+1R+2CLSW Development Technologies Petr Pulc Petr Pulc (Gar.)Z32PZTechnological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin 

# Charakteristiky p edmet 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 b	asics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every comp	uting curriculum. I	t 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 asymptot	c 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 fir	nite automata, reg	ular expressions
and regular grammars, t	ranslation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships betwee	n formal language	s and automata.
Knowledge acquired thr	ough the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translatio	n, and design of o	ligital 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 perfo	rm during the
semester. If he fulfill the	se 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 s	tudents to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in loc	al networks and i	n the Internet as
well. The lectures will be	amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw	work technologies	. Students
practically verify configu	rations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS	S.	
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5
Students understand ba	sic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, in	nputs, outputs, da	ta storage and
transfer. In the labs, stud	lents gain practical experience with the design and implementation of the logic of a simple processor using modern digital d	esign tools.	
BIE-KAB.21	Cryptography and Security	Z,ZK	5
Students will understand	d the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able t	o use cryptograpł	nic keys and
certificates in systems b	ased on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in a	pplications. Within	n labs, students
will gain practical skills i	n using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedure	s of cryptanalysis	. Students are
expected to be compete	nt 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 stor	e (including integ	rity constraints)
using a conceptual mod	el and then implement them in a relational database engine. They get acquainted with the SQL language and also with its the	oretical basis - rel	ational database
model. They will get acq	uainted with the principles of relational database schema normalization. They understand the basic concepts of transaction	processing and co	ontrol 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 acquai	nted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts	from set theory v	vill be explained.
Special attention is paid	to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The co	ourse also lays do	wn the basics of
combinatorics and number	per theory, with emphasis on modular arithmetics.		
BIE-TDP.21	Documentation and Presentation	KZ	3
The course is focused o	n the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typical	ly final university	heses. Students
learn to create text of a	technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically pr	esent 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 1	4 days of teachin	g. 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 ca	n be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in E	nglish comparable	to or exceeding
the B2 level of the Com	non European Framework of Reference for Languages.		
BIE-LA1.21	Linear Algebra 1	Z,ZK	5
We will introduce studer	ts to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the fie	eld of real and cor	nplex numbers
	s. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian eli		,
the connection with lines	ar manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eige	nvalues and eiger	vectors of a
matrix. We will also dem	onstrate 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 number	ers. 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 fu	nctions. This theor	etical 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 sin	nple optimization
problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical desc	cription of complex	ity 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 w	ill learn how to inte	egrate 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	n to the computation	on of elementary
functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms	s, and its analysis u	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, v	ve 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 in	ntegration of multiv	ariate 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	l implementations,	race conditions,
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS n	nonitoring. They ar	e 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 variable	s. They will be ab	e 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	o perform
estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statist	ical hypotheses ar	nd 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, struct	ured), expression	s, statements,
and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundame	ntal 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, enlargeab	le 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 pro	gramming,
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 studer	ts to Git, the inform	mation 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 comput	er structures look	ike 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 r	educe the consum	ption; 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 s	upply 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	e functions of mult	user operating
systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic prop	erties of this OS fa	amily, 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 the system of the syste	el of advanced us	ers 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 tv specializace		

#### Název bloku: Povinné p edm ty specializace Minimální po et kredit bloku: 35 Role bloku: PS

Kód skupiny: BIE-PI-PS.24

Název skupiny: Compulsory Courses of Bachelor Specialization Computer Engineering, version 2024 Podmínka kredity skupiny: V této skupin musíte získat 35 kredit

Podmínka p edm ty skupiny: V této skupin musíte absolvovat 7 p edm t Kredity skupiny: 35

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z,L	PS
BIE-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	PS
BIE-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-PNO.21	Practical Digital Design Martin Novotný	KZ	5	2P+2C	Z	PS
BIE-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	PS

# Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-PS.24 Název=Compulsory Courses of Bachelor Specialization Computer Engineering, version 2024

Computer Engineering, version 2024		
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. Specific and the second	ecial 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 p	rinciples of instru	ction processing
not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of	of the sequential n	nodel of the
program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory co	pherence and con	sistency 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	r dynamic system	is 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	I with the internal	structure and
organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using app	ropriate codes for	implementation
of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, inclu	ding codes for err	or detection and
correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of corr	nmunication of the	e 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 micro	oprogrammed pro	cessor 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 systems and evelop software for them.	edded processors	, their integrated
peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
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 Unive	ersal serial bus (U	SB). The course
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of L	JSB devices, Linu	x 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 t	he basics of the V	HDL language
and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern	industry-standard	CAD design
tools.		
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 issue	es. Theoretical know	owledge 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: Volitelné n edm. tv oboru/specializace		

#### Název bloku: Volitelné p edm ty oboru/specializace Minimální po et kredit bloku: 0 Role bloku: VO

### Kód skupiny: BIE-PI-VO.21

Název skupiny: Elective vocational Courses of the Bachelor Specialization Computer Ingeneering, ver. 2021 Podmínka kredity skupiny:

Podmínka p edm ty skupiny:

### Kredity skupiny: 0

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-SPS.21	Administration of Computer Networks and Services Libor Dostálek, Jan Kubr Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	VO
BIE-AG2	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	VO
BIE-TAB.21	Applications of Security in Technology Jan B lohoubek, Ji í Dostál, Maciej Skórski, Martin Pozd na <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, František Ková, Martin Šutovský <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-ZSB.21	Basics of System Security Ji í Bu ek, Simona Forn sek, Martin Šutovský, Marián Svetlík Simona Forn sek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-KOM	Conceptual Modelling Robert Pergl	Z,ZK	5	2P+2C	Z	VO

BIE-EHA.21	Ethical Hacking	Z,ZK	5	2P+2C	L	vo
	Ji í Dostál, Andrej Šimko, Martin Kolárik <b>Ji í Dostál</b> Ji í Dostál (Gar.) Hardware Security		-			
BIE-HWB	Ji í Bu ek	Z,ZK	5	2P+2C	Z	VO
BIE-IOT.21	Internet of Things Pavel Tvrdík, Viktor erný, Lenka Kosková T ísková Lenka Kosková T ísková Lenka Kosková T ísková (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-UKB.21	Introduction to Cybersecurity Jan B lohoubek, Ivana Trummová, David Pokorný, Tomáš Rabas, Tomáš Lu ák <b>Jan B lohoubek</b> Jan B lohoubek (Gar.)	Z,ZK	5	3P+1C	Z	VO
BIE-IDO.21	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-TJV.21	Java Technology Ond ej Rozinek Ond ej Rozinek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-SIP.21	Network Programming Jan Fesi Jan Fesi Jan Fesi (Gar.)	Z	5	2P+2C	Z	VO
BIE-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha <b>Filip K ikava</b> Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-PJP	Programming Languages and Compilers Jan Janoušek	Z,ZK	5	2P+1C	L	VO
BIE-PPA	Programming Paradigms Petr Máj	Z,ZK	5	2P+2C	Z	VO
BIE-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-SWI.21	Software Engineering Stanislav Kuznetsov, Zden k Rybola, Jakub Jab rek, Ond ej Rozinek Zden k Rybola Zden k Rybola (Gar.)	Z,ZK	5	2P+1C	L	VO
BIE-SP1.21	<b>Team Software Project 1</b> Stanislav Kuznetsov, Zden k Rybola, Jakub Jab rek, Ond ej Rozinek <b>Zden k</b> <b>Rybola</b> Zden k Rybola (Gar.)	ΚZ	5	4C	L	VO
BIE-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Zden k Rybola Zden k Rybola (Gar.)	KZ	5	2C	Z	VO
BIE-ADU.1	Unix Administration Petr Zemánek	Z,ZK	5	2P+2C	L	VO
BIE-VDC.21	Virtualization and Data Centers Ji í Kašpar <b>Ji í Kašpar</b> Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-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

# Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-VO.21 Název=Elective vocational Courses of the Bachelor Specialization Computer Ingeneering, ver. 2021

BIE-SPS.21	Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is	to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administration	ited under the op	erating systems
Linux and Windows. The	e course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained	by practical hand	s-on experience
with real network infrast	rructure.		
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-TAB.21	Applications of Security in Technology	Z,ZK	5
The goal of the course i	s to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stud	lents get a broad	er overview of
cybersecurity applicatio	ns and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.		
BIE-ASB.21	Applied Network Security	Z,ZK	5
The aim of the course is	s to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gai	ned in course BI-	PSI with actual
security applications like	e the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishin	g the course stud	lent will get
knowledge of security a	pplications in computer networks.		
BIE-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
Students are introduced	I to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the class	sical tasks from th	ne areas of state
space search, multi-age	ent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorit	nms and the neur	al networks, will
be presented as well.			
BIE-ZSB.21	Basics of System Security	Z,ZK	5
The goal of the course i	s to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of foren	sic analysis and	related topics
such as malware analys	sis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of mod	ern operating sys	stems security,
as well as skills needed	for independent work in the area of operating system security incident analysis.		
BIE-TPS.21	Computer Networks Technologies	Z,ZK	5
The course introduces s	students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physic	cal layer with the	overlap to the
link layer. The lectures p	provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective techn	ologies will be de	monstrated and
with the most important	ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethe	rnet, modern wir	eless networks,
always with focus on hig	gh-speed networks.		

BIE-KOM	Conceptual Modelling	Z,ZK	5
	the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the		
	te and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will		•
-	IntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Studer		
	as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the E rd to the continuity of software implementations.		gy. The course is
BIE-EHA.21	Ethical Hacking	Z,ZK	5
The goal of the course	s to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vu	Inerabilities, and t	heir possible
exploitation in compute	networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus	is on hands-on e	xperience with
vulnerabilities testing a	ad the following process of penetration test documentation.		
BIE-HWB	Hardware Security	Z,ZK	5
	ardware resources used to ensure security of computer systems including embedded ones. The students become familiar w		-
,, , ,	the security features of modern processors, and storage media protection through encryption. They will gain knowledge about		
-	ttacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card	l technology includ	ling applications
-	ulti-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.	7 71/	
BIE-IOT.21	Internet of Things an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an c	Z,ZK	5 s and actuators
	technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT archi		
	iter labs, students will gain practical experience with developing simple IoT systems using common development environmer		
software - Arduino, Ras			,,,
BIE-UKB.21	Introduction to Cybersecurity	Z,ZK	5
	s to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic o		-
and attacker techniques	s, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.		
BIE-IDO.21	Introduction to DevOps	Z,ZK	5
The course deals with t	he topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of	systems and serv	ices. The course
covers the tools to supp	ort software development, testing and compilation. It also focuses on tools for automating infrastructure management and bu	ilding and deployi	ng software to
the Cloud. It is an introd	uction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquai	nted with modern	technologies
used in practice.			
BIE-TJV.21	Java Technology	Z,ZK	5
The aim of the course is	to provide knowledge and skills needed for the development of smaller and larger information systems. Students will get ac	quainted with gen	eral theoretical
concepts and will be ab	le to apply these concepts using libraries and tools from the ecosystem of the Java programming language. After completing	the course studer	nts will be able
	elopment of software systems on the Java platform. Students are assumed to be acquainted with the following topics (they and	re used and not ta	ught in this
course): Java language	syntax, SQL, git version control system, Docker, continuous integration.		
BIE-LOG.21	Mathematical Logic	Z,ZK	5
	the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiat		
	formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, a	-	
	blean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and		e syntactic
	cal logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems	-	
BIE-SIP.21	Network Programming	Z	5 Decelector The
	amental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level prog		
	to designing communication protocols and their verification. The third part introduces the principles and applications of middle n models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in cc	-	
programming language			g a chosch
BIE-OOP.21	Object-Oriented Programming	Z,ZK	5
	nming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth		
	uainted with the main principles of object-oriented programming and design, used in modern programming languages. The er		-
-	which includes testing, error handing, refactoring, and application of design pattern.		
BIE-PJP	Programming Languages and Compilers	Z,ZK	5
-	nethods of implementation of common high-level programming languages. They get experience with the design and implement	· · · ·	
	ing language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that h		
form and write a compil	er 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 process	ing text in a language defined by a LL(1) grammar.		
BIE-PPA	Programming Paradigms	Z,ZK	5
BIE-BEK.21	Secure Code	Z,ZK	5
The students will learn l	ow to assess security risks and how to take them into account in the design phase of their own code and solutions. After gettin	· · ·	threat modeling
theory, students gain pr	actical experience with running programs with reduced privileges and methods of specifying these privileges, since not every	/ program needs t	o run with
administrator privileges	Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securin	g data and the rel	ationships of
security and database s	systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the o	defense against th	iem.
BIE-VPS.21	Selected Topics in Computer Networking	Z,ZK	5
The course builds upon	the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and techr	nologies used in m	odern computer
	a networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practi	-	h real network
	earning important methods of local area and wide area networks from the viewpoint of functionality, performance, and securit	-	
BIE-SWI.21	Software Engineering	Z,ZK	5
	d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They		
	the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hand	-	
	ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig	-	nin the course,
-	poretical basis in the field of project management, estimation of costs of software projects, and methods of their development		
BIE-SP1.21		1/7	
	Team Software Project 1	KZ	5
-	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	e BIE-SWI course	that runs
concurrently and that te	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the aches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teams are students necessary techniques and principles.	e BIE-SWI course acher, in the role of	that runs of the team and
concurrently and that te	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the aches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teat consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	e BIE-SWI course acher, in the role of	that runs of the team and

BIE-SP2.21	Team Software Project 2	KZ	5
Students gain hands-on	experience with the iterative development process while working on a large-scale software project. The first iteration is the res	sult of the BIE-SP	1 course project.
However, in this follow-u	ip, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will we	ork in teams of 4-6	6 people. The
teacher, in the role of th	e team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their s	olution.	
BIE-ADU.1	Unix Administration	Z,ZK	5
Students became familia	ar with the internal structure of Unix-like systems, with the administration of their basic subsystems and with the principles of the	eir protection agai	nst unauthorized
use. In the seminars the	y will verify the information from the lectures on real life examples from practice. They will understand the differences betwee	en user and admir	nistrator roles.
They gain theoretical an	d practical knowledge of tools for tracking, analyzing, debugging and securing systems, implementing and managing file syst	ems, disk subsyst	ems, processes,
memory, network servic	es, shared file systems, name services, remote access, and system boot.		
BIE-VDC.21	Virtualization and Data Centers	Z,ZK	5
-	Virtualization and Data Centers to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a	· ·	-
The aim of the course is		and implementation	on of data center
The aim of the course is infrastructure, such as v	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design	and implementation	on of data center es from private
The aim of the course is infrastructure, such as v to public and hybrid clou	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a rarious kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of	and implementation center technologie s. Students will un	on of data center es from private derstand the
The aim of the course is infrastructure, such as v to public and hybrid clou	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a arious kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data or uds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications.	and implementation center technologie s. Students will un	on of data center es from private derstand the
The aim of the course is infrastructure, such as v to public and hybrid clou design, validation, and of BIE-AWD.21	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a arious kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of uds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa	and implementation center technologies. Students will un ages, and data los Z,ZK	on of data center as from private derstand the ses. 5
The aim of the course is infrastructure, such as we to public and hybrid cloud design, validation, and of BIE-AWD.21 Students will get acquait	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a rarious kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of uds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa Web and Database Server Administration	and implementation center technologies. Students will un iges, and data los Z,ZK ind backup completed	on of data center as from private derstand the ses. 5
The aim of the course is infrastructure, such as we to public and hybrid cloud design, validation, and of BIE-AWD.21 Students will get acquait	to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a rarious kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of uds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa Web and Database Server Administration Inted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a	and implementation center technologies. Students will un iges, and data los Z,ZK ind backup completed	on of data center as from private derstand the ses. 5

Název bloku: Povinn volitelné p edm ty Minimální po et kredit bloku: 10 Role bloku: PV

Kód skupiny: BIE-PI-PV-BEZ.24

Název skupiny: Compulsory elective Courses of Bc. Specialization Computer Engineering, Field of Security, v. 2024

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 ) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-EHA.21	Ethical Hacking Ji í Dostál, Andrej Šimko, Martin Kolárik <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-ADU.21	Unix Administration Zden k Muziká, Petr Zemánek <b>Petr Zemánek</b> Petr Zemánek (Gar.)	Z,ZK	5	2P+2C	L	PV

# Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-PV-BEZ.24 Název=Compulsory elective Courses of Bc. Specialization Computer Engineering, Field of Security, v. 2024

BIE-EHA.21 Ethical Hacking	Z,ZK	5
The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats,	ulnerabilities, and	their possible
exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The foc	us is on hands-on e	experience with
vulnerabilities testing and the following process of penetration test documentation.		
BIE-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 ge	ting familiar with th	e threat modeling
theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not ev	ery program needs	to run with
administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of secu	ring data and the re	elationships of
security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	e defense against t	hem.
BIE-ADU.21 Unix Administration	Z,ZK	5
Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles	They will understa	nd the differences
between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access r	ghts, 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	ne lectures on
specific examples from practice.		

### Kód skupiny: BIE-PI-PV-TEO.24

Název skupiny: Compulsory elective Theoretical Courses of Bachelor's Specialization Computer Engineering, v. 2024

Podmínka kredity skupiny: V této skupin n	nusíte získat alespo	5 kredit (ı	maximáln 15)	
Podmínka p edm ty skupiny: V této skupin	musíte absolvovat	alespo 1 p	o edm t ( maximáln	3)
Kredity skupiny: 5				

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-LA2.21	Linear Algebra 2 Karel Klouda, Marzieh Forough Karel Klouda Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-PJP.21	Programming Languages and Compilers Tomáš Pecka, Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	PV

#### Charakteristiky p edmet této skupiny studijního plánu: Kód=BIE-PI-PV-TEO.24 Název=Compulsory elective Theoretical Courses of Bachelor's Specialization Computer Engineering, v. 2024

**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. 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. Z,ZK

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

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

5

Název bloku: Volitelné p edm ty Minimální po et kredit 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 p edm ty skupiny:

Kredity skupiny: 0

Poznanika ke sk				,		
Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len ) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V
BIE-ZRS	Basics of System Control Kate ina Hyniová	Z,ZK	4	2P+2C	L	V
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BIE-SCE1	Computer Engineering Seminar I Hana Kubátová, Miroslav Skrbek Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
BIE-SCE2	Computer Engineering Seminar II Hana Kubátová, Ji í Vysko il Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	Czech Language for Foreigners Tomáš Houdek, Markéta Hofmannová, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	V
BIE-CZ1.21	Czech Language for Foreigners II Tomáš Houdek, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	V
UKCJP	eština pro pokro ilé Tomáš Houdek, Jakub Šenovský, Jakub Šolc, Adam Vostárek <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z,ZK	2	2BP+2BC	Z,L	V
BIE-DIF	Differential equations Antonella Marchesiello, Ond ej Bouchala, Jan Valdman Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-EPR	Economic project Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	V
BIE-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	V
BIE-HAS	Human Factors in Cryptography and Security Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V

FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-IMA	Introduction to Mathematics Karel Klouda	Z	4	3C	Z	v
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	v
BIE-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	v
BIE-OOP	Object-Oriented Programming Filip K ikava	Z,ZK	4	2P+2C	Z	V
BIE-PKM	Preparatory Mathematics Jitka Rybní ková Tomáš Kalvoda (Gar.)	Z	4		Z	V
BIE-PJV	Programming in Java Jan Blizni enko Jan Blizni enko Jan Blizni enko (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
BIE-PRR.21	Project management David Pešek David Pešek (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BIE-SKJ.21	Scripting Languages Jan Ž árek, Lukáš Ba inka Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2P+2C	L	V
BIE-VAK.21	Selected Combinatorics Applications Michal Opler, Dušan Knop Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BIE-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
BI-SCE1	Seminá po íta ového inženýrství l Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVV	T lesná výchova	Z	0	0+2	Z,L	V
TVV0	T lesná výchova 0	Z	0	0+2	Z,L	V
TV2K1	T lesná výchova 2	Z	1		L,Z	V
TVKLV	T lovýchovný kurz	Z	0	7dní	L	V
BIE-TUR.21	User Interface Design Jan Schmidt Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	v
BIE-VR1.21	Virtual reality I Petr Klán Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	v
BIE-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
FITE-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	Z	v
BIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	v
BIE-3DT.1	3D Printing Marek Žehra	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 class	sical tasks from t	he areas of state
space search, multi-age	nt systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	thms and the neu	ral networks, will
be presented as well.			
BIE-ZRS	Basics of System Control	Z,ZK	4
Volitelný p edm t základ	dy ízení systém je ur en pro všechny zájemce o aplikovanou informatiku v bakalá ském studiu. Alespo 🏾 p ehledové znalos	ti oboru automati	ckého ízení
budou pro naše absolve	enty jist konkuren ní výhodou a zhodnotí je bezesporu v pr myslové praxi. Studenti získají znalosti v dynamicky se rozvíjejí	cím oboru s velko	u budoucností.
Zam íme se zejména r	a ízení inženýrských a fyzikálních sysém. Poskytneme vám základní informace z oblasti zp tnovazebního ízení lineárnícl	n dynamických jed	dnorozm rových
systém . Seznámíme va	ás s metodami vytvá ení popisu a modelu systém, základní analýzou lineárních dynamických systém a návrhem a ov ení	m jednoduchých z	zp tnovazebních
PID, PSD a fuzzy regulá	tor. Pozornost je v nována rovn ž sníma m a ak ním len m v regula ních obvodech, otázkám stability regula ních obvo	d, jednorázovém	uaprbžnému
nastavování parametr	regulátoru a n kterým aspekt m pr myslových realizací spojitých a íslicových regulátor . Jednotlivá témata p ednášek jsou	provázena množ	stvím užite ných
p íklad a praktických p	r myslových realizací.		
BIE-CCN	Compiler Construction	Z,ZK	5
This is an introductory of	lass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle	s of compilers for	students to
understand the design a	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 Comput	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistan	e to failures and a	attacks. Students
are approached individu	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of t	he subject is wor	k with scientific
articles and other profes	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead	hers. The topics a	are new for each
semester.			
BIE-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Comput	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistand	e to failures and a	attacks. Students
are approached individu	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	he subject is wor	k with scientific
articles and other profes	sional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead	hers. The topics a	are new for each
semester.			
BIE-CZ0	Czech Language for Foreigners	KZ	2
Course Czech for foreig	ners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.		J

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.	1	
basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Re		
UKCJP eština pro pokro ilé	Z,ZK	2
	ζ_Γ	2
Kurz pokro ilé eštiny pro ukrajinské studenty, kte í mají status uprchlíka. Zkouška potvrdí znalost eštiny na úrovní 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	al solution method	Is 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 applicati	ons. Finally, an in	roduction to
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD	Es and PDEs, inc	luding 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).	-	
	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 of		
globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial act		e
from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of		
Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical	al tools used in thi	s field.
BIE-HAS Human Factors in Cryptography and Security	Z,ZK	5
P edm 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, k	te 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 ko	ntextu kybernetick	ké bezpe nosti
zam ené na lov ka.		·
BIE-CSI Introduction to Computer Science	Z	2
This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in oth	-	
science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	0	
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 int	erested in comput	er science more
than expected, or even less than before.		
BIE-EHD Introduction to European Economic History	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 econ	omy through the c	lescription 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 ed	conomic 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	•	
course does not cover the detailed economic history of particular European countries but rather the impact of trade and the role of particular events		-
history. Class meetings will consist of a mixture of lectures and discussions.		iganizations in
	7 71/	0
FITE-EHD Introduction to European Economic History	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 econ		-
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 ed	conomic 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 dec	iphered. 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 c	rganizations in
history. Class meetings will consist of a mixture of lectures and discussions.		
BIE-IMA Introduction to Mathematics	Z	4
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a		nem in particular
examples.		
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	are able to apply th	iem in particular
BIE-ST1 Network Technology 1	Z	3
P edm t je zam en na získání základních znalosti z oblasti po íta ových sítí a praktických zkušeností se sí ovými technologiemi. P edm t odpovíc	la látce kurikula C	isco Netacad
programu - CCNA1 - R&S Introduction to Networks.		
BIE-OOP Object-Oriented Programming	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 togeth	ier by message pa	ssing. 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 dev		
handing, refactoring and design patterns.	-	
BIE-PKM Preparatory Mathematics	Z	4
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.		
	7 71/	4
BIE-PJV Programming in Java	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	a language the fu	ndamental APIs
will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.		
BIE-PS2 Programming in shell 2	Z,ZK	4
Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In a	ddition, 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 Erasmu	is students: We ar	e 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,	In. mkdir. rm) a	nd 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 s	-	
techniques used in practice.		yy
	7 71/	F
BIE-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	-	-
project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk		-
Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for	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.		

BIE-SKJ.21	Scripting Languages	Z,ZK	4
Join us on a tour into th	e world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry stan	dards, as well as a	a couple of other
standard text processir	g utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. W	/e will provide a ge	eneral overview
of scripting languages	and introduction into their pros and cons and students get practical experience with shell script programming. We will touch a	lso ROFF, PerlDoo	, 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 a	dvanced program	ming techniques
and tricks that get over	ooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the sc	ripting world. Luká	š is a renowned
lecturer in advanced sh	ell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer wh	ose code contribu	tes to safe and
streamline operations of	of cloud service datacenters around the globe.		
BIE-VAK.21	Selected Combinatorics Applications	Z	3
	oduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the	ne basic courses, v	ve approach the
	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some b		
	ation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical)		
will select problems to	be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optim	nization and more.	Students will
also try to implement s	olutions to the studied problems with a special focus on the effective use of existing 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	1 · · 1	eries and their
-	introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the		
	problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.		
BI-SCE1	Seminá po íta ového inženýrství l	Z	4
	inženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odoln	1 – 1	·
	edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitel		
	ou odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíra		
nová.		, , , , , , , , , , , , , , , , , , , ,	, ,
BIE-SEG	Systems Engineering	Z	0
	class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	1 – 1	-
	or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After tak		
	ce between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co	-	
	ocesses and threads synchronize efficiently to overcome concurrency for communication.		
TVV	T lesná výchova	Z	0
		Z	0
TVV0	T lesná výchova 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 of	verview of methods for designing and testing common user interfaces. They get experience to solve the problems where soft	tware and other pr	oducts 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 dev	velopment process to ensure optimal interface for them.		
BIE-VR1.21	Virtual reality I	KZ	4
Introduction to Virtual F	Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The	e course focuses o	on the ways of
creating virtual reality v	vorlds 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 th	, e architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the	e standard admini	stration and
security tools and apply	/ advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adn	ninistrate
heterogeneous system	s. Students are able to effectively configure centralised administration of a computer network.		
FITE-SEP	World Economy and Business	Z,ZK	4
	students of technical universities to international business. It does that predominantly by comparing individual countries and I		
Students get to know a	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo	m, corruption and	economic
development, which are	e needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individua	al readings.	
BIE-SEP	World Economy and Business	Z,ZK	4
-	students of technical universities to international business. It does that predominantly by comparing individual countries and l	1 1	
	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo		
s a	e needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individua	· ·	
-			
BIE-3DT 1	3D Printing	k7	1
BIE-3DT.1 Students learn to desid	3D Printing	KZ	4
	3D Printing n three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design obje	1 1	

### Seznam p edm t tohoto pr chodu:

Kód	Název p edm tu	Zakon ení	Kredity
BI-SCE1	Seminá po íta ového inženýrství l	Z	4
Seminá po íta ov	ého inženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odolnost	i proti poruchám a	útok m. Ke
student m se v rán	nci p edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitelem	Sou ástí p edm	tu je práce s
v deckými lánky a	i jinou odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíraná	témata jsou pro ka	ždý semestr
	nová.		
BIE-3DT.1	3D Printing	KZ	4
Students learn to o	esign three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects	, prepare for printi	ng and print
	in 3D.		

BIE-AAG.21	Automata and Grammars	Z,ZK	5
	luced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite		•
	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between for red through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,		
BIE-ADU.1	Unix Administration	Z,ZK	5
	amiliar with the internal structure of Unix-like systems, with the administration of their basic subsystems and with the principles of their p	1 '	
	ars they will verify the information from the lectures on real life examples from practice. They will understand the differences between	-	
They gain theoretic	al and practical knowledge of tools for tracking, analyzing, debugging and securing systems, implementing and managing file systems memory, network services, shared file systems, name services, remote access, and system boot.	s, disk subsystems,	, processes,
BIE-ADU.21		Z,ZK	5
	he internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They		
between user and a	administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,	file systems, disk s	subsystems,
processes, memo	bry, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known	owledge from the le	ectures on
	specific examples from practice.	7 74	
BIE-ADW.1	Windows Administration	Z,ZK	4
	tand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the nd apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting		
	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 cover	s the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing	ng curriculum. It is	
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 lea	rn to handle
	practically the asymptotic mathematics.	7 71/	-
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-APS.21	Architectures of Computer Systems n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec	Z,ZK	5
	n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Specific processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principle of the students will understand the basic concepts of RISC and CISC architectures and the principle of the students will understand the basic concepts of RISC and CISC architectures and the principle of the students will understand the basic concepts of RISC and CISC architectures and the principle of the students will understand the basic concepts of RISC and CISC architectures and the principle of the students will understand the basic concepts of the students will understand the		
	r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of		
program. The cours	se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe	rence and consiste	ency in such
	systems.		
BIE-ASB.21	Applied Network Security	Z,ZK	5
	Irse is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gaine		
security applicat	ions like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing knowledge of security applications in computer networks.	g the course stude	ni wili gei
BIE-AWD.21	Web and Database Server Administration	Z,ZK	5
	cquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and l	· ·	
-	ice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam		
			31.
BIE-BAP.21	Bachelor Thesis	Z	14
BIE-BAP.21 BIE-BEK.21	Bachelor Thesis Secure Code	Z Z,ZK	14 5
BIE-BAP.21 BIE-BEK.21 The students will le	Bachelor Thesis Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa	Z Z,ZK amiliar with the thre	14 5 at modeling
BIE-BAP.21 BIE-BEK.21 The students will le theory, students	Bachelor Thesis Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every	Z Z,ZK amiliar with the thre program needs to	14 5 at modeling run with
BIE-BAP.21 BIE-BEK.21 The students will le theory, students administrator priv	Bachelor Thesis Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing	Z Z,ZK amiliar with the thre program needs to data and the relati	14 5 at modeling run with onships of
BIE-BAP.21 BIE-BEK.21 The students will le theory, students administrator priv security and	Bachelor Thesis Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	Z Z,ZK amiliar with the thre program needs to data and the relati	14 5 at modeling run with onships of
BIE-BAP.21 BIE-BEK.21 The students will le theory, students administrator priv security and BIE-BPR.21	Bachelor Thesis Secure Code arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing	Z Z,ZK amiliar with the three program needs to data and the relati ne defense against Z	14 5 eat modeling run with onships of them. 1
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	Discourts Mathematics and Lapis	7 71/	
BIE-DML.21	Discrete Mathematics and Logic	Z,ZK	5
Students will get a	cquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts fro	m set theory will be	e explained.
Special attention is	s paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The cours	e also lays down t	he basics of
	combinatorics and number theory, with emphasis on modular arithmetics.		
BIE-EEC	English language external certificate	Z	4
The BIE-ECC cour	se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Engli	sh comparable to c	or exceeding
	the B2 level of the Common European Framework of Reference for Languages.		0
		7 71	
BIE-EHA.21	Ethical Hacking	Z,ZK	5
The goal of the c	ourse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln	erabilities, and the	ir possible
-	nputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is		-
		on nanas on expe	merice with
	vulnerabilities testing and the following process of penetration test documentation.		
BIE-EHD	Introduction to European Economic History	Z,ZK	3
	ices a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy		rintion of the
		-	
	ods. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro	-	
the Roman Emp	ire to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial ir	stitutions is deciph	nered. The
course does not c	cover the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, in:	stitutions and orga	nizations in
	history. Class meetings will consist of a mixture of lectures and discussions.	•	
BIE-EPR	Economic project	Z	1
	. This course is an extension of the course Introduction to European Economic History (BIE-EHD).		
		7 71/	
BIE-FTR.1	Financial Markets	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	t risk, and
alobalization of ma	arket activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activitie	s many firms nee	d araduates
	hools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of fin		
Markets cours	se thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistic	cal tools used in th	is field.
BIE-GIT.21	SW Development Technologies	7	3
			1
I his course is aim	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to		on 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	Human Factors in Cryptography and Security	Z,ZK	5
			-
Pedm tje ur en s	tudent 👖 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 i i	mplementuji
šifry po uživatele	aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v konte	xtu kybernetické b	ezpe nosti
	zam ené na lov ka.		
		7 71/	
BIE-HWB	Hardware Security	Z,ZK	5
The course dea	Is with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar wit	h the operating pri	nciples of
cryptographic mod	lules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about v	ulnerabilities of HV	
Including side-chai	nnel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card teo	chnology including	applications
	and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of	ciphers.	
BIE-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	tems and services.	. The course
covers the tools to	o support software development, testing and compilation. It also focuses on tools for automating infrastructure management and build	ing and deploying	software to
the Cloud. It is an	n introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquaint	ed with modern te	chnologies
			onnologioo
	used in practice.		
BIE-IMA	Introduction to Mathematics	Z	4
Students refresh a	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	able to apply them	in particular
			in partioulai
	examples.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh a	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	able to apply them	in particular
			in partioulai
	examples.		
BIE-IOT.21	Internet of Things	Z,ZK	5
	s on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an over		
	ication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architection and the second s		
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).		
		7 71/	
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 v	vith the internal str	ucture and
organization of cor	nputer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using approp	riate codes for imp	ementation
-	ne organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including		
-		-	
correction for para	llel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of comm	unication of the pro	ocessor with
the environment ar	nd the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micropro	ogrammed process	sor simulator
	and programmable hardware design kits (FPGA).		
		7 71/	-
BIE-KAB.21	Cryptography and Security	Z,ZK	5
Students will un	derstand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to	use cryptographic	keys and
	tems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in app		-
-			
will gain practical	skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of	л cryptanalysis. St	udents are
	expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.		
BIE-KOM	Conceptual Modelling	Z,ZK	5
			1
I he course focuse	s on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the abi	nty to distinguish k	ey concepts
in the domain, ca	ategorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will le	earn the basics of	ontological
	ng in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Student		-
L Lnterprise Engine	ering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the DEM	io methodology. T	ne course is
	also designed with regard to the continuity of software implementations.		
L			

	L'us an Alashan A		
	Linear Algebra 1	Z,ZK	5
	Idents to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of		
	elds. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimina		-
the connection with	I linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenv	alues and eigenv	ectors of a
	matrix. We will also demonstrate some applications of these concepts in computer science.		
BIE-LA2.21	Linear Algebra 2	Z,ZK	5
tudents will broader	n 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 intr	oduce vecto
	al abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear algebr		
graphics. The other	main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The issue:		ear algebra
	will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be pre-	sented.	_
BIE-LOG.21	Mathematical Logic	Z,ZK	5
he 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 equivale	nce, and the
gical consequence	of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are e	xplained. This rel	ates to the F
vs. NP problem an	d Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and	their models. The	e syntactic
approach t	o mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness the	orems is explaine	ed.
BIE-MA1.21	Mathematical Analysis 1	Z,ZK	5
e 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. T	hen we study rea	al sequences
nd real functions of a	a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functio	ons. This theoretic	al foundation
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
roblems (i.e., the iss	ue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description	on of complexity o	of algorithms
BIE-MA2.21	Mathematical Analysis 2	Z,ZK	6
1	es the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students will le	,	ate by parts
	on method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to t	•	
nctions with a preso	ribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and	d its analysis usin	ig the Maste
theorem. Finally, w	e introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and H	lessian matrix, we	e study the
nalytical method of l	ocalization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integr	ation of multivaria	ate functions
BIE-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
	d on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal	,	The course
	e and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB		
	drivers, simple application development, and APIs of selected devices.		
BIE-OOP	Object-Oriented Programming	Z.ZK	4
	gramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	,	sing. In this
	me of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software develop		-
	handing, refactoring and design patterns.	J J	0.
BIE-OOP.21	Object-Oriented Programming	Z,ZK	5
	gramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together		-
	icquainted with the main principles of object-oriented programming and design, used in modern programming languages. The empha-		
and students get a	for developing software, which includes testing, error handing, refactoring, and application of design pattern.		arteeninquee
	ter dereteping contrare, mien meldder termig, en er nanding, reiderening, and appreader er deelgin paderin		
	Operating Systems	7 76	5
1	Operating Systems	Z,ZK	5
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 imp	lementations, rac	e conditions
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 imp d scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monit	lementations, rac oring. They are a	e conditions
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h this course that is a ritical regions, thread BIE-PA1.21	follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp d scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monit and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Wi Programming and Algorithmics 1	lementations, rac oring. They are a indows. Z,ZK	ble to design
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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.				
BIE-PS2	Programming in shell 2	Z,ZK	4		
Students get a gen	eral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit	ion, they gain a de	eper 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					
	vide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln,	-			
data filtering tool	s (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 sel	ection of advanced	discripting		
	techniques used in practice.	7 71/	<b>_</b>		
BIE-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 network				
	actically verify configurations and management of network devices in the lab within the environment of the operating systems Linux a	-	oludonio		
BIE-PST.21	Probability and Statistics	Z,ZK	5		
	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T	, ,	-		
	m variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-			
estimations of unk	nown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical	hypotheses and c	letermining		
	the statistical dependence of two or more random variables.				
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5		
	nd basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, input	-	-		
	In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern of	digital design tools			
BIE-SCE1	Computer Engineering Seminar I	Z	4		
	nputer 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 teacher				
and other p	semester.	3. The topics are r			
BIE-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 teacher	rs. The topics are r	new for each		
	semester.				
BIE-SEG	Systems Engineering	Z	0		
This is an introduct	ory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of o	operating systems	for students		
	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking				
understand the	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.	ncurrency is, as op	posed to		
		7 71/	4		
BIE-SEP	World Economy and Business	Z,ZK	4		
The course introdu	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key	regions of the wor	ld economy.		
The course introdu Students get to	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom	regions of the wor n, corruption and e	ld economy. economic		
The course introdu Students get to develop	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom ment, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on i	regions of the wor n, corruption and e	ld economy. economic		
The course introdu Students get to develop BIE-SIP.21	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom	regions of the wor n, corruption and e ndividual readings Z	ld economy. economic 5		
The course introdu Students get to develop BIE-SIP.21 The course covers	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor ment, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on i Network Programming	regions of the wor n, corruption and e ndividual readings Z ming using BSD s	ld economy. economic 5 sockets. The		
The course introdu Students get to develop BIE-SIP.21 The course covers second part is deve	World Economy and Business ces students of technical universities to international business. It does that predominantly by comparing individual countries and key know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor ment, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on i Network Programming fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level program	regions of the wor n, corruption and e ndividual readings Z ming using BSD s re technologies. T	Id economy. economic 5 sockets. The he final part		
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BIE-ST1	Network Technology 1	Z	3		
P edm t je zam	en na získání základních znalosti z oblasti po íta ových sítí a praktických zkušeností se sí ovými technologiemi. P edm t odpovída l	látce kurikula Cisco	Netacad		
	programu - CCNA1 - R&S Introduction to Networks.				
BIE-SWI.21	Software Engineering	Z,ZK	5		
	ainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They co				
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,					
	Idents also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their	-			
BIE-TAB.21	Applications of Security in Technology	Z,ZK	5		
The goal of the co	urse is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stude cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware s	-	overview of		
			<u> </u>		
BIE-TDP.21	Documentation and Presentation	KZ	3 Studente		
	sed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fin of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese	-			
	course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14				
the teacher. The	exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.	days of teaching.			
BIE-TJV.21	Java Technology	Z,ZK	5		
	 Irse is to provide knowledge and skills needed for the development of smaller and larger information systems. Students will get acqua		-		
	be able to apply these concepts using libraries and tools from the ecosystem of the Java programming language. After completing the	-			
	the development of software systems on the Java platform. Students are assumed to be acquainted with the following topics (they are				
	course): Java language syntax, SQL, git version control system, Docker, continuous integration.	abou and not ladg			
BIE-TPS.21	Computer Networks Technologies	Z.ZK	5		
	uces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physica	· · ·	-		
	res provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technolo				
	rtant ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernic	•			
	always with focus on high-speed networks.	- ,	,		
BIE-TUR.21	User Interface Design	Z,ZK	5		
	asic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where softwa		-		
-	the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gair				
	bring users into the development process to ensure optimal interface for them.				
BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5		
	inted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer st		-		
	oduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to redu				
limits to the maxim	um operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a com	nputer power supply	y looks like		
	(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.				
BIE-UKB.21	Introduction to Cybersecurity	Z,ZK	5		
The goal of the co	urse is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic over	view of threats in c	yberspace		
	and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace reg	julations.			
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 the second se	nctions of multiuse	r operating		
systems for comp	uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic propert	ies of this OS famil	ly, such as		
	eads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level o				
only able	e to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting int				
BIE-VAK.21	Selected Combinatorics Applications	Z	3		
	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the ba		•		
	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic				
-	ticipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info				
will select probler	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization algorithms are solved with a second factor of a solved second s	ation and more. Stu	idents will		
	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.	771			
BIE-VDC.21	Virtualization and Data Centers	Z,ZK	5		
	rse is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and				
	h as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data cen rid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications.	-	-		
	ation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, ou				
BIE-VES.21	Embedded Systems	Z,ZK	5		
	esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded	. · .			
Students learn to u	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.	eu processors, mer	rintegrateu		
BIE-VMM	Selected Mathematical Methods	Z,ZK	4		
	s with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then add				
-	r, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wa				
	he linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting		e ename		
BIE-VPS.21	Selected Topics in Computer Networking	Z,ZK	5		
	pon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technolo				
	al area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical	-	-		
	vices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance	-			
BIE-VR1.21	Virtual reality I	KZ	4		
	tual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The co	ourse focuses on th	ne 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		
	t základy ízení systém je ur en pro všechny zájemce o aplikovanou informatiku v bakalá ském studiu. Alespo p ehledové znalosti				
budou pro naše at	osolventy jist konkuren ní výhodou a zhodnotí je bezesporu v pr myslové praxi. Studenti získají znalosti v dynamicky se rozvíjejícím	ı oboru s velkou bu	doucností.		
Zam íme se zejména na ízení inženýrských a fyzikálních sysém. Poskytneme vám základní informace z oblasti zp tnovazebního 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 tnovazebních 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-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-ZSB.21 Basics of System Security Z.ZK 5 The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis. **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. FITE-EHD Introduction to European Economic History 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. FITE-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 TV2K1 T lesná výchova 2 7 1 TVKLV T lovýchovný kurz Ζ 0 TVV T lesná výchova Ζ 0 TVV0 7 T lesná výchova 0 0 Z.ZK UKCJP 2 eština pro pokro ilé Kurz pokro ilé eštiny pro ukrajinské studenty, kte í mají status uprchlíka. Zkouška potvrdí znalost eštiny na úrovní B2 s platností pro VUT

Aktualizace výše uvedených informací naleznete na adrese <u>http://bilakniha.cvut.cz/cs/FF.html</u> Generováno: dne 15.06.2025 v 05:24 hod.