Studijní plán

Název plánu: Bachelor Specialization Computer Engineering, 2021

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 students who have been enrolled for study from the academic year 2021/2022 into the full-time form of study of the bachelor's program. . Guarantor: doc. Ing. Hana Kubátová, CSc., email: hana.kubatova@fit.cvut.cz Název bloku: Povinné 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 If you plan to profile yourself in the specialization Information Security, Computer Networks and Internet, Poznámka ke 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 Kód (u skupiny p edm t seznam kód jejích len) Zakon ení Kredity Rozsah Semestr Role Vyu ující, auto i a garanti (gar.) Algorithms and Graphs 1 BIE-AG1.21 Z,ZK 5 2P+2C Ζ PP Tomáš Valla, Michal Opler, Ji ina Scholtzová, Dušan Knop, Maria Saumell Mendiola Dušan Knop Dušan Knop (Gar.) Automata and Grammars **BIE-AAG.21** 5 2P+2C Ζ Z,ZK PP Jan Holub **Jan Holub** Jan 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 Architectures BIE-SAP.21 Z.ZK L 5 2P+1R+2C PP Petr Fišer, Hana Kubátová Petr Fišer Petr Fišer (Gar.) **Cryptography and Security** Ji í Bu ek, Martin Jure ek, Filip Kodýtek, Josef Kokeš, Jaroslav K íž, Róbert **BIE-KAB.21** Z,ZK 5 2P+2C L PP Lórencz, Ivana Trummová, František Ková, David Pokorný Ji í Bu ek Róbert Lórencz (Gar.) **Database Systems** BIE-DBS.21 Z,ZK 5 2P+2R+1L L PP Josef Pavlí ek. Otto Šleger. Martin Urbanec Josef Pavlí ek Josef Pavlí ek (Gar.) **Discrete Mathematics and Logic BIE-DML.21** Z.ZK 5 2P+1R+1C 7 PP Eva Pernecká, Jitka Rybní ková, Francesco Dolce Eva Pernecká Eva Pernecká (Gar.) **Documentation and Presentation BIE-TDP.21** 3 K7 2P+2C Z,L PP Dana Vynikarová Dana Vynikarová Dana Vynikarová (Gar.) English language external certificate **BIE-EEC** 7 4 2D L PP Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)

2P+1R+1C

5

Z,ZK

Ζ

PP

Linear Algebra 1

Marzieh Forough Karel Klouda Marzieh Forough (Gar.)

BIE-LA1.21

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
Operating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík 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
Unix-like Operating Systems Jan Trdli ka, Jakub Žitný, Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	KZ	5	2P+2C	Z	PP
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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	ting curriculum.	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 asymptotic mathematics.							
BIE-AAG.21	Automata and Grammars	Z.ZK	5				
Students are introduced	to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of fir	ite automata, req	ular expressions				
	ranslation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships betwee		•				
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 c	digital circuits.				
BIE-BPR.21	Bachelor Project	Z	1				
At the beginning of the	semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that	student will 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	e amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced net	work technologies	. Students				
	rations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS						
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5				
	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	dents 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	the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able t	I ' I	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. Withir	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	d 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 numl	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 f	theses. Students				
learn to create text of a	technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically 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 14 days of teaching. Within the							
exercises of the course,	an active approach to the creation of individual parts of the bachelor's thesis is assumed.						
BIE-EEC	English language external certificate	Z	4				
The BIE-ECC course ca	n be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in E	nglish comparable	e to or exceeding				
the B2 level of the Common European Framework of Reference for Languages.							
BIE-LA1.21	Linear Algebra 1	Z,ZK	5				
We will introduce studer	nts to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	ld of real and cor	nplex numbers				
and also over finite field	s. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elin	nination method (GEM) and show				
the connection with line	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 demonstrate some applications of these concepts in computer science.							

BIE-MA1.21 Mathematical Analysis 1	Z,ZK	5					
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine 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 functions. This theoretical foundation							
is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization							
problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical 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 will learn how to integrate by parts							
and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem	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 supply looks like							
(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.							
BIE-UOS.21 Unix-like Operating Systems	KZ	5					
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating							
systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as							
processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not							
only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell.							
Název bloku: Povinné p edm tv specializace							

Název bloku: Povinné p edm ty specializace Minimální po et kredit bloku: 40 Role bloku: PS

Kód skupiny: BIE-PI-PS.21

Název skupiny: Compulsory Courses of Bachelor Specialization Computer Engineering, version 2021 Podmínka kredity skupiny: V této skupin musíte získat 40 kredit Podmínka p edm ty skupiny: V této skupin musíte absolvovat 6 p edm t

Kredity skupiny: 40

Poznámka ke skupině:

	1					
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 (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-LA2.21	Linear Algebra 2 Karel Klouda, Marzieh Forough Karel Klouda Karel Klouda (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 Computer Enginee	edmet této skupiny studijního plánu: Kód=BIE-PI-PS.21 Náz ering, version 2021	zev=Compulsory	Courses	of Bache	lor Spec	cialization
	Architectures of Computer Systems			7	Z,ZK	5
	onstruction principles of internal architecture of computers with universal processor	s at the level of machine	e instructio	1	·	-
	cessing and on the memory hierarchy. Students will understand the basic concepts			-		-
	sors, but also in superscalar processors that can execute multiple instructions in or					, ,
	ther elaborates the principles and architectures of shared memory multiprocessor a					
systems.						-
BIE-ZRS.21	Basics of System Control			Z	Z,ZK	5
	oduction to the field of automatic control. It focuses particularly on the control of en	gineering and physical s	systems. It o	covers basic k	nowledge	of the feedback
control of linear dynamic	al single-input-single-output systems. Students will learn the methods of creating d	escriptions of system m	odels, basi	c linear dynar	nic system	s analysis, and
design and verification of	f simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors	s and actuators in contro	l loops, iss	ues of stability	/ of control	systems, single
and continuous adjustm	ent of the controller parameters, and certain aspects of the industrial implementatic	ons of continuous and di	gital contro	llers.		
BIE-JPO.21	Computer Units			Z	Z,ZK	5
Students deepen their b	asic knowledge of digital computer units acquired in the obligatory course of the pro	ogram (BIE-SAP), get a	cquainted in	n detail with th	ne internal	structure and
organization of compute	r units and processors and their interactions with the environment, including acceler	rating arithmetic-logic ur	nits and usi	ng appropriate	e codes for	implementation
of multiplication. The org	anization of main memory and other internal memories (addressable, LIFO, FIFO a	and CAM) will be discuss	sed in detai	I, including co	des for erro	or detection and
correction for parallel an	d serial data transmissions. They will also get acquainted with the methodology of c	controller design, with the	e principles	of communic	ation of the	Processor with
the environment and the	architecture of the bus system. The problems will be practically evaluated in the labs	and with the help of the	educationa	al microprogra	mmed proc	essor simulator
and programmable hard	ware design kits (FPGA).					
BIE-VES.21	Embedded Systems			Z	Z,ZK	5
Students learn to design	embedded systems and develop software for them. They get basic knowledge of the	e most common microco	ntrollers an	d embedded p	processors,	, their integrated
peripheral circuits, progr	amming methods, and applications. They get practical skills with development kits a	and tools.				
BIE-LA2.21	Linear Algebra 2			Z	Z,ZK	5
Students will broaden th	eir knowledge gained in the BIE-LA1 introductory course, where only vectors in the	form of n-tuples of numl	bers were d	onsidered. He	ere we will i	introduce vector
spaces in a general abs	tract form. The notions of a scalar product and a linear map will enable to demonstr	ate the profound link be	tween linea	ar algebra, geo	ometry, and	d computer
graphics. The other main	n topic will be numerical linear algebra, in particular problems with solving systems	of linear equations on c	omputers. 7	The issues of r	numerical li	inear algebra
will be demonstrated ma	inly on the matrix factorization problem. Selected applications of linear algebra in v	arious fields will be pres	sented.			
BIE-MPP.21	Methods of interfacing peripheral devices			Z	Z,ZK	5
The course is focused of	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices	is focused on technique	es based or	n Universal se	rial bus (US	SB). The course
includes both PC side a	nd peripheral devices side. Labs are practically oriented. Students gain experience	with implementation of r	elevant par	rts of USB dev	vices, Linux	< and Windows
drivers, simple application	on development, and APIs of selected devices.					
BIE-PNO.21	Practical Digital Design				KZ	5
Students get an overvier	w of the contemporary digital design flow and learn practical skills to use synchronom	ous design techniques. T	hey unders	stand the basi	cs of the V	HDL language
and implementation tech	nologies FPGA and ASIC. Students demonstrate practical use of the design techni	iques in the course proje	ect using m	odern industr	y-standard	CAD design
tools.						
BIE-SRC.21	Real-time systems			Z	Z,ZK	5
	c knowledge in the real-time (RT) system theory and in the design methods for RT	systems including the d	ependabilit	y issues. The	oretical knc	wledge from
lectures will be experime	entally verified in department specialized labs. The course is mainly focused on emb	bedded RT systems, the	erefore the	design kits in f	the lab are	the same as in
the BIE-VES course and	I FPGAs.					
Názov bloku: E	lovinn velitelné nedm tv					

Název bloku: Povinn volitelné p edm ty Minimální po et kredit bloku: 5 Role bloku: PV

Kód skupiny: BIE-PI-PV.21

Název skupiny: Compulsory elective Courses of Specialization Computer Engineering, version 2021 Podmínka kredity skupiny: V této skupin musíte získat alespo 5 kredit (maximáln 15) Podmínka p edm ty skupiny: V této skupin musíte absolvovat alespo 1 p edm t (maximáln 3) Kredity skupiny: 5

Poznámka ke skupině:

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

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

 BIE-ZUM.21
 Artificial Intelligence Fundamentals
 Z,ZK
 5

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

				- 1		-
	Programming Languages and Compilers hthods of implementation of common high-level programming languages. They get experie	ence with the desi	gn and impl		Z,ZK of individual co	5 mpiler part
for a simple programming	language: data types, subroutines, and data abstractions. Students are able to formally s	specify a translation	on of a text	that has a ce	ertain syntax ir	ito a target
	based on such a specification. The notion of compiler in this context is not limited to com g text in a language defined by a LL(1) grammar.	pilers of program	ming langua	ages, but exi	tends to all oth	er program
	Secure Code			Z	Z,ZK	5
•	vat a zohled ovat bezpe nostní rizika p i návrhu svého kódu a ešení v b žné inženýrské	•		•		
	rogram pod nižšími oprávn ními a jak tato oprávn ní stanovovat, protože ne každý prog rizika spojená s p ete ením bufferu. Dále se studenti budou krátce v novat zabezpe ení d			-	-	
	at útok m typu DoS (Denial of Service) a obran proti nim.		·			
	litelné p edm ty					
•	t kredit bloku: 0					
Role bloku: V						
Kód skupiny: Bl	E-V.2021					
Název skupiny:	Purely Elective Bachelor Courses, Version 2021 till	2024/25				
Podmínka kredi	ty skupiny:					
Podmínka p edi	m ty skupiny:					
Kredity skupiny:	:0					
Poznámka ke s	kupině:					
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.)	КZ	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.)	КZ	2	4C	Z,L	V
UKCJP	eština pro pokro ilé Tomáš Houdek, Jakub Šenovský, Jakub Šolc, Adam Vostárek Zden k Muziká 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 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 <i>Filip K ikava</i>	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 (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	ssical 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 algori	thms and the neur	al networks, will				
be presented as well.							
BIE-ZRS	Basics of System Control	Z,ZK	4				
Volitelný p edm t zákla	y ízení systém je ur en pro všechny zájemce o aplikovanou informatiku v bakalá ském studiu. Alespo pehledové znalos	ti oboru automatio	kého ízení				
	nty jist konkuren ní výhodou a zhodnotí je bezesporu v pr myslové praxi. Studenti získají znalosti v dynamicky se rozvíjejí						
Zam íme se zejména i	a ízení inženýrských a fyzikálních sysém . Poskytneme vám základní informace z oblasti zp tnovazebního ízení lineárníc	h dynamických jec	norozm rových				
	ás s metodami vytvá ení popisu a modelu systém , základní analýzou lineárních dynamických systém a návrhem a ov ení						
	tor . Pozornost je v nována rovn ž sníma ma ak ním len mv regula ních obvodech, otázkám stability regula ních obvo						
nastavování parametr	regulátoru a n kterým aspekt m pr myslových realizací spojitých a íslicových regulátor . Jednotlivá témata p ednášek jsou	provázena množs	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				
	and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme						
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 resistant	ce to failures and a	ttacks. Students				
	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of						
	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	-					
semester.							
BIE-SCE2	Computer Engineering Seminar II	Z	4				
	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance	ce to failures and a	ttacks. 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 subject is work	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 tea	chers. 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.	I I					
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2				
-	for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language.	I I	- 1				
	arifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Rep						
UKCJP	eština pro pokro ilé	Z,ZK	2				
	ro 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				
	pundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essenti	I ' I	s like separation				
	ms on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered						
polynomial analysis, foll	owed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicati	ons. Finally, an int					
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit							
partial differential edual		Es and PDEs, incl					
		Es and PDEs, incl					
	ions (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD	Es and PDEs, incl					

Finances durations many measurements in the monethy parses, which his to a decomposition of a structure of the structure of the structure of productions and productions, and productions and measurements and an advantances of the structure of th	BIE-FTR.1 Financial Markets	Z,ZK	5
The technical schedule with the analyticant invoking is (17 and maintenatics, and with theore, and a conjunction of the technical metal analytical schedule analytical to be used in the technical metal analytical schedule analytical to be used in the technical metal analytical schedule analytical schedule analytical metal m		1 · · ·	dit risk, and
Names a concrete our engloses to the securities of Infrared market and restare and exerctive of maintermarket and subsidiated out of inits retex. EVEX.15 P edits (our enclose): EVEX.15 P edits (our enclose): EVEX.15 P edi	globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial act	ivities, many firms	need graduates
BIEHAS Human Factors in Cryptography and Security Z.K 5 Peter is an enclosule of the security of the security in the security of the se	from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of	financial markets.	The Financial
P den type an enderin n. Jere arguins negen medermatica is a learn of a unit of an ensight hydeely possible topolitic by obtain the option 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.
timp or classes applicable, Student student to decryption provide a student back should a analyze wych visatnich projekt. V kontexu k whermedod backer normalize and the student is near student backer. The point of the student is near student is near student and the student is near student in the student is near student in the student is near student in the student is near student in the student is student in the student in the student is student in the stude		1 ' 1	-
Tent end to via. Introduction to Computer Science Z Z This is an introductory class on Elementary Computer Science is made and decire to undestand the addorts in computer science. The gain of the class is to introduct and the addorts in computer science. The gain of the class is to introduct and the addorts in computer science. The gain of the class is to introduct and the addorts in computer science. The gain of the class is to introduct and the addorts in computer science. The gain of the class is to introduct and the addorts in computer science. The gain of the class is to interval and the addort is introducted and the addort is intraducted and the addort is introducted anddort is introducted and the addort is introducted a			
BIE-CSI Introduction to Computer Science to trad addresses bachely students in computer science, students maying in other firsts built introduce and interest bachely students. Not provide science, high-heat programming backets in introduce and interest bachely students active to understand the students backets or understand the students backets. Not private science, high-heat programming backets and students backets and provide science during the science is the science and who heat backets backets. Note that the science is the science and who heat backets backets and provide science during the science is the science and who heat backets backets is the science and who heat backets backets. Note that the science is the science and who heat backets backets and science is the science and who heat backets backets backets. Z X 3 BIE-END Instructures and event head backets		ntextu kybernetick	é bezpe nosti
The is an includuotory dates on Elementary Computer Science for blocal audiences. Includes and real sciences, subartes mayoring no mice sciences. The grant of the dates is to includuot and real sciences, blocates doubles and real to account in the science in th			
sames, high-school students, anythody, with a background in basic muth and the desire to understand the atizedule basics of comparer solutions are paral of the class is to introduce and relate back projecting of compare social compares solutions are able to anythol with a background in basic of the able to anythol with solutions are able to anythol with a background in the able able anythol with a background in the able able anythol with a background in the able able anythol with able able able able able able able able		1 – 1	
and relate back principles of computer science for students to understand, easy on, what computer science a, wy things such as high-set operations in the computer science are obtained on the work high and exists, students are delto an assort for just tables computer science registeries of all students and the starts during and exists and tables are delto an assort for just tables computer science are the anaessort for just tables of the store in the student back to follow up with, deally realizing if they are interacted in computer science are the anaessort for just tables of the store in the store interaction computer science are the anaessort for just tables of the store interaction in the store interaction of the store interaction in the store interact and the science are the store and compared tables and there is a particular science are the store and compared tables and there is a particular science are the store and compared tables and there is a particular science are the science are			•
down lew yn hy an, mei de min, wur, an baie, per generentatie mei apsatin duit de person teider. Mei taking me class, auderets are alte to arwer to just takin computer solence or wan expected, or went less tan before. EEE CHD Introduction to European economic heatory II gives the student basic knowledge about forming of the goals accombite atoms of the about to the heat takes in the solence of the student basic knowledge about forming of the goals accombite atoms of the about to the heat takes in the solence of the solence o		-	
apestions but also puestions about themselves such as which causes to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected. "Or while the production to European Economic history if yies the student basic knowledge about forming of the global economy through the description of the forman Entropic as a section of themse from European economic history if yies the student basic knowledge about forming of the global economy through the description of the forman Entropic of the Midda Agas. Them de discussion of modern financial individuos ad discussions. The course site does not cover the destination of the discussion of discussions. The format actions the high respective of particular European economic history of particular events, history Case meetings will consist of a moture of letures and discussions. Elective and discussions. Elective and discussions exists of another of letures and economic history of particular events, history Case meetings will consist of a moture of letures and discussions. Elective and discussions exists of another of letures and discussions. Elective and discussions exists of another of letures and economic history of particular events, Students understand basic mathematical principles and they are also to particular events, institutor actions and their properties. Students understand basic mathematical principles and they are also to apply them in particular events, institutor actions and their properties. Students understand basic mathematical p			
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BIE-EHD Introduction to European Economic History Z.K 3 The course intoduces a selection of thems from European countries in the process is focuses produminantly on their roles in economic hances, instructions is depletered. The course does not cover the dualed economic history of particular European countries but them the impact of trade and the role of particular events, institutions and organizators in history. Cases methodings all consists of a mature of lectures and discussions. Z.K 3 FITE-EHD Introduction to European Economic History (Will to the current afficuations is depletered. The course focuses a section of thems from European economic history (Will to the current afficuations is depletered. The course infolduces a section of thems from European economic history (Will to the current afficuations is depletered. The course infolduces a section of thems from European economic history (Will to the current afficuations is depletered. The course infolduces is depletered. The course infolduces is depletered. The acourse focus and the role allowable acourty infolduces is depletered. The course infolduces is depletered. The acourse focus and the role additional section of themse and infolduces is depletered. The course focus and teacher Monet (Particular European econtries but their the impact of trade and the role of particular events, institutions and organizators in history. Case method sectors multication is depletered in a particular acourses. BIE-EMAA Introduction to Mathematics Z 4 3 2 2 2 3 2 2 2 2 2 2 3		created in comput	
The course is electricic is electricic of themes tom European economic history, if gives the student basic knowledge about forming of the global economy though the elege economic area of the Roma European counter is have of the testing economic history of practical institutions is description of the store description of		7 7K	3
key historical periods. As European countries have been dominant actors in this process it bocuses predominantly on their roles in accomment hatory. From the singue concenic area of the Roman Enropic to the Roman Enropic to the Konte description of WWI to the current datas, the development of modern financial instauros is descriptions on the discussions. FITE-END Introduction to European Economic History The course introduces a solection of themes from European economic history. It proves it bocuses predominantly on their roles in accomment history. From the large accomment history, themes metalizations and explanations in this process it focuses predominantly on their roles in accomment history. From the large accomment history is the set that the the impact of transmeticing of the global economic history. From the large accomment area of discussions. Ele-INA Introduction to Mathematics Ele-Mination and explanation of the Midde Agent of the Solece accomment history is the set that the the impact of transmeticing principles and they are able to apply them in particular accompany. Ele-ST1 Network Technology 1 Z Z Guidens refrash and extend howeledge of elementary functions and their propertes. Students understand basic mathematical principles and they are able to apply them in particular accompany. Ele-ST1 Network Technology 1 Z Z Guidens refrash and extend howeledge of elementary functions and their propertes. Students understand basic mathematical principles and they are able to apply them in particular accompany. Ele-ST1 Network Technology 1 Z/Z C Guidens refrash and extend howeledge of elementary functions and their propertes. Students understand basic mathematical principles and they are able to apply them in particular accompany. Ele-ST1 Network Technology 1 Z/Z C Guidens refrash and extend howeledge of elementary functions and their propertes. Students understand basic mathematical principles an		1 · · ·	-
the Roma Empire to the tragmentation of the Mickle Ages, from the destruction of WWI to the current affairs, the development of maker influences is deephered. The interry, Class meetings, will consist of a mickle or flectures and decasions. FTE-EHD Introduction to European economic history of micro theorem is not another of particular ownes, institutions and organizations in history, Class meetings, will consist of a mickle or flectures and decasions. FTE-EHD Introduction to European economic history, it gives the student basic modeling about forming of the decay for the decay formed and the class of adout the decay for the decay formed and the class of adout the decay formed and the class of adout the decay for the decay formed is the forman history. The other state and the class of adout the decay for the decay formation in history Class meetings, will consist of a mickle of flectures and decay and decay and decay and a decay and adout the decay formation of the Mickle Ages, from the destruction of WWI to be current affains, the development of modeling and urganizations in history Class meetings, will consist of a mickle of flectures and decay and			-
httery: Class meeting: will consist of a mixture of lectures and decisions. FIFE:EHD Introduction to European Economic History in the constraint action this process it focuses a selection of themes from European economic history. It gives the student basic knowledge about forming of the description of the descripti		-	
FITE-EHD Introduction to European Economic History ZK 3 The ourse introduction a product a selection of thems from European economic history. If you the student basic knowledge about forming of the global commy through the secupiton of the key history. From the large economic history of particular Events, from the destruction of WWI to the evelopment of mode in financial institutions is clocked basics of the advectment affers, the development of mode in financial institutions is clocked basics of the financial institutions is clocked basics. Z 4 Students rifts hand extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Z 2 2 Students rifts hand extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. BIE-IMA Introduction to Mathematics 2 Z 2 Students rifts hand extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Z 3 BIE-IMA Introduction to Mathematics 2 Z 3 3 Part right and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. Z/K 4 Depict-Oriented Programming in Sub are to sob	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 o	rganizations in
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BIE-VMM	Selected Mathematical Methods	Z.ZK	4				
	an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then	, _, I	eries and their				
s and a second se	introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the						
the linear programming	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				
Seminá po íta ového inženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odolnosti proti poruchám a útok m. Ke							
student m se v rámci p	edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitel	lem. Sou ástí p eo	dm tu je práce s				
v deckými lánky a jino	u odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíra	aná témata jsou pr	o každý semestr				
nová.							
BIE-SEG	Systems Engineering	Z	0				
This is an introductory of	ass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	of operating syste	ems for students				
	r and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After tak	•					
understand the differen	ce between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co	ncurrency is, as o	pposed to				
parallelism, and how pr	ocesses and threads synchronize efficiently to overcome concurrency for communication.						
TVV	T lesná výchova	Z	0				
TVV0	T lesná výchova 0	Z	0				
TV2K1	T lesná výchova 2	Z	1				
TVKLV	T lovýchovný kurz	Z	0				
BIE-TUR.21	User Interface Design	Z,ZK	5				
Students gain a basic o	verview of methods for designing and testing common user interfaces. They get experience to solve the problems where soft	ware and other pr	oducts do not				
	ser optimally, since the needs and characteristics of users are not taken into account during product development. Students	gain an overview	of methods that				
	elopment process to ensure optimal interface for them.						
BIE-VR1.21	Virtual reality I	KZ	4				
	eality (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 w	vorlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities.						
BIE-ADW.1	Windows Administration	Z,ZK	4				
	e architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the						
	advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adm	ninistrate				
heterogeneous systems	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						
	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo		economic				
	e needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individuate						
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	e needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individual	-					
BIE-3DT.1	3D Printing	KZ	4				
• •	n three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design obje	cts, prepare for pr	inting and print				
in 3D.							

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	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 t	u 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 t	émata jsou pro ka	ždý semestr				
	nová.						
BIE-3DT.1	3D Printing	KZ	4				
Students learn to o	besign three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects	, prepare for printir	ng and print				
	in 3D.						
BIE-AAG.21	Automata and Grammars	Z,ZK	5				
Students are introd	uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	automata, regular	expressions				
and regular gramm	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between fo	mal languages an	d automata.				
Knowledge acqui	red through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,	and design of digi	tal circuits.				
BIE-ADW.1	Windows Administration	Z,ZK	4				
Students unders	and the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the	standard administr	ation and				
security tools a	nd apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adm	inistrate				
heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.							
BIE-AG1.21	Algorithms and Graphs 1	Z,ZK	5				
The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked							
with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle							
	practically the asymptotic mathematics.						

BIE-APS.21	Architectures of Computer Systems	Z,ZK	5		
	n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec				
	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the prince	-			
-	r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe				
	systems.				
BIE-BAP.21	Bachelor Thesis	Z	14		
BIE-BEK	Secure Code	Z,ZK	5		
	posuzovat a zohled ovat bezpe nostní rizika p i návrhu svého kódu a ešení v b žné inženýrské praxi. Od teorie modelování bezpe i	· · ·	-		
	í b h program pod nižšími oprávn ními a jak tato oprávn ní stanovovat, protože ne každý program musí nutn b žet s administrátor				
prakticky demonstr	ována rizika spojená s p ete ením bufferu. Dále se studenti budou krátce v novat zabezpe ení dat a jak toto zabezpe ení souvisí s da	abázovými systémy	y a webem.		
	V záv ru se budou v novat útok m typu DoS (Denial of Service) a obran proti nim.				
BIE-BPR.21	Bachelor Project	Z	1		
At the beginning of	of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that st semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.	udent will perform of	during the		
BIE-CCN	Compiler Construction	Z.ZK	5		
	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	,	-		
	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	-			
BIE-CSI	Introduction to Computer Science	Z	2		
	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fit	elds but interested in			
science, high-scho	pol students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go	al of the class is to	introduce		
	rinciples of computer science for students to understand, early on, what computer science is, why things such as high-level programmed programmed and the statement of the state				
	v are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no				
questions but also	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interes	ted in computer sci	ence more		
BIE-CZ0	than expected, or even less than before.	KZ	2		
DIE-CZU	Czech Language for Foreigners Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time	1	2		
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2		
	nded for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The		pands the		
	c vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the				
BIE-DBS.21	Database Systems	Z,ZK	5		
	ainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (i				
	model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its theoret at acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction pro				
model. mey will ge	user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database m	-			
BIE-DIF	Differential equations	Z,ZK	5		
	es a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential so				
of variables. Key t	heorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with	h methods like cha	racteristic		
	sis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world application	-			
partial differential	equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs	and PDEs, includir	ng implicit		
	and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.	7 71/			
BIE-DML.21	Discrete Mathematics and Logic cquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts fro	Z,ZK	5 ovplained		
-	paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The cours	-			
opeoial attention is	combinatorics and number theory, with emphasis on modular arithmetics.		0 003103 01		
BIE-EEC	English language external certificate	Z	4		
	se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Englis	sh comparable to or	exceeding		
	the B2 level of the Common European Framework of Reference for Languages.				
BIE-EHD	Introduction to European Economic History	Z,ZK	3		
	ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy	-			
	ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Frc	-			
	re to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial in over the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, ins				
	history. Class meetings will consist of a mixture of lectures and discussions.	situtions and organ			
BIE-EPR	Economic project	Z	1		
	This course is an extension of the course Introduction to European Economic History (BIE-EHD).	- 1			
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	risk, and		
globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates					
	pools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of fin-				
	thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistic SW Development Technologies	ai tools used in this			
BIE-GIT.21		7			
	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to		3 n manager		
BIE-HAS	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use	Git, the informatio	n manager		
BIE-HAS Pedmtjeurenst	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to	o Git, the informatio	n manager 5		
Pedmtjeurenst	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use Human Factors in Cryptography and Security	Git, the informatio	n manager 5 nplementují		
P edm t je ur en st šifry po uživatele a	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use Human Factors in Cryptography and Security tudent m, které zajímá nejen matematická a technická stránka v ci, ale i p emýšlení nad tím, jestli výsledný produkt bude použitelný pro aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v konte zam ené na lov ka.	o Git, the informatio	n manager 5 nplementují		
P edm t je ur en st šifry po uživatele a BIE-IMA	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use Human Factors in Cryptography and Security tudent m, které zajímá nejen matematická a technická stránka v ci, ale i p emýšlení nad tím, jestli výsledný produkt bude použitelný pro aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v konte zam ené na lov ka. Introduction to Mathematics	o Git, the informatio	n manager 5 nplementují szpe nosti 4		
P edm t je ur en st šifry po uživatele a BIE-IMA	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use Human Factors in Cryptography and Security tudent m, které zajímá nejen matematická a technická stránka v ci, ale i p emýšlení nad tím, jestli výsledný produkt bude použitelný pro aplikací). Studenti budou moci využít nabyté v domosti z tohoto kurzu k návrhu, plánování a analýze svých vlastních projekt v konte zam ené na lov ka.	o Git, the informatio	n manager 5 nplementují szpe nosti 4		

BIE-IMA2	Introduction to Mathematics 2	Z	2	
Students refresh ar	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	ble to apply them i	in particular	
	examples.			
BIE-JPO.21	Computer Units	Z,ZK	5	
	their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail v			
organization of corr	puter units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using approp	riate codes for imp	lementation	
of multiplication. Th	e organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including	g codes for error de	etection and	
correction for parall	el and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of comm	unication of the pro	cessor with	
the environment an	d 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	or simulator	
	and programmable hardware design kits (FPGA).			
BIE-KAB.21	Cryptography and Security	Z,ZK	5	
	erstand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to		-	
-	ems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in appl			
will gain practical	skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of	of cryptanalysis. Stu	udents are	
	expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.			
BIE-LA1.21	Linear Algebra 1	Z,ZK	5	
	students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	-		
	fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian eliminative linear particular was find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find their investigation of the will also be a the find the will also be a the will also be a the find the will also be a the will also be a the find the will also be a the will also be a the find the will also be a the wi	•	,	
the connection w	th linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenv matrix. We will also demonstrate some applications of these concepts in computer science.	alues and eigenve	ectors of a	
		774		
BIE-LA2.21	Linear Algebra 2 en their knowledge gained in the BIE-LA1 introductory course, where only vectors in the form of n-tuples of numbers were considered	Z,ZK	5 duce vector	
	ral abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear algeb			
	er main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The issue		-	
graphics. The othe	will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be pre-		ai aigebia	
BIE-MA1.21	Mathematical Analysis 1	Z,ZK	5	
	e by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers.		-	
-	f a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of function	-	-	
	ot-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and			
	ssue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of finding extrema of functions).	-	-	
BIE-MA2.21	Mathematical Analysis 2	Z,ZK	6	
	etes the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students will le		-	
	ution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to	-		
	scribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, an	•		
	we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and H	, ,		
	f localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integ		-	
BIE-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5	
	ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa	I ' I	-	
	ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE	()		
	drivers, simple application development, and APIs of selected devices.			
BIE-OOP	Object-Oriented Programming	Z.ZK	4	
Object-oriented p	rogramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	by message passi	ing. 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 develo	pment including te	sting, error	
	handing, refactoring and design patterns.			
BIE-OSY.21	Operating Systems	Z,ZK	5	
	a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp		conditions,	
critical regions, thre	ad scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS moni	toring. They are ab	le to design	
	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W	indows.		
BIE-PA1.21	Programming and Algorithmics 1	Z,ZK	7	
	construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structure			
and functions pre	esented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundamen	tal algorithms for se	earching,	
	sorting, and manipulating linked lists and trees.			
BIE-PA2.21	Programming and Algorithmics 2	Z,ZK	7	
	instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que			
table). They lear	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e	.g., template progr	ramming,	
	copying/moving of objects, operator overloading, inheritance, polymorphism).	r		
BIE-PJP	Programming Languages and Compilers	Z,ZK	5	
	sic methods of implementation of common high-level programming languages. They get experience with the design and implementation			
	mming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has		•	
form and write a co	mpiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but	extends to all othe	er programs	
	for parsing and processing text in a language defined by a LL(1) grammar.	771	4	
BIE-PJV	Programming in Java		4	
The course Flogra	mming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java la will also be presented, especially data structures files. GUL petwerking, databases and experiment APIs	nguage the fundam	neniai AFIS	
	will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.	7	A	
BIE-PKM	Preparatory Mathematics	Z	4	
	The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.		~	
BIE-PNO.21	Practical Digital Design	KZ	5	
u u	erview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the			
and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design				
	tools.			

BIE-PRR.21	Project management	Z,ZK	5
The aim of the co	burse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, anal	ysis, crisis manage	ement in a
	cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as		-
	ource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st		
deepening their l	cnowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar	ge companies. The	course is
BIE-PS2	also suitable for all those who will develop software or hardware in the form of team projects.	7 71/	4
	Programming in shell 2 neral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit	Z,ZK	4
	shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus st		
	wide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, In,		
	Is (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		
	techniques used in practice.		
BIE-PSI.21	Computer Networks	Z,ZK	5
The course introdu	ices students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local r	etworks and in the	Internet as
well. The lecture	es will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw	ork technologies.	Students
	actically verify configurations and management of network devices in the lab within the environment of the operating systems Linux a		
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	-	
	om variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-	
estimations of un	known distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical	nypotneses and d	etermining
	the statistical dependence of two or more random variables.	7 71/	F
BIE-SAP.21	Computer Structures and Architectures and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inpu	Z,ZK	5 torage and
	r. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern of	-	and and
BIE-SCE1	Computer Engineering Seminar I	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	_	
	individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		
	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	,	
	semester.		
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	failures and attack	s. Students
	ndividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		
articles and other	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are n	ew for each
	semester.		
BIE-SEG	Systems Engineering	Z	0
	tory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of o		
to understand pro	cessor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking	the class, students	are able to
understand the	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor	ncurrency is, as opp	posed to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-SEP	World Economy and Business	Z,ZK	. 4
	aces 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	-	
5	poment, which are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on i		CONDINIC
BIE-SKJ.21	Scripting Languages	Z,ZK	4
	to the world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry standard		
	essing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. We w		
	ges and introduction into their pros and cons and students get practical experience with shell script programming. We will touch also		
	into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you adva		
and tricks that get	overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the scripti	ng world. Lukáš is a	a renowned
lecturer in advanc	ed shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whose	code contributes t	o safe and
	streamline operations of cloud service datacenters around the globe.		
BIE-SRC.21	Real-time systems	Z,ZK	5
	he basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues		с С
lectures will be ex	perimentally verified in department specialized labs. The course is mainly focused on embedded RT systems, therefore the design kit	s in the lab are the	same as in
	the BIE-VES course and FPGAs		
BIE-ST1	Network Technology 1	Z	3
P edm t je zam	en na získání základních znalosti z oblasti po íta ových sítí a praktických zkušeností se sí ovými technologiemi. P edm t odpovída	látce kurikula Cisco	o Netacad
	programu - CCNA1 - R&S Introduction to Networks.		
BIE-TDP.21	Documentation and Presentation	KZ	3
	sed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fi	-	
	t of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese		
the teacher. The	course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.	uays of teaching. V	wiu in the
		771	5
BIE-TUR.21	User Interface Design basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where softwa	Z,ZK	5 Icts do not
-	the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gai		
	bring users into the development process to ensure optimal interface for them.		
BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	ainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer si		
	roduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to redu		
-	num operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a con	-	
	(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		
	systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative fu	I I I I I I I I I I I I I I I I I I I	-		
	uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic proper				
processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not					
only able	to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting in	terface, called shel	I.		
BIE-VAK.21	Selected Combinatorics Applications	Z	3		
The course aims to	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the base	asic courses, we a	oproach the		
issue from applicat	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	data structures. F	urthermore,		
with the active part	icipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info	rmatics. Areas fror	n which we		
will select problem	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimiz	ation and more. Stu	udents will		
	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.				
BIE-VES.21	Embedded Systems	Z,ZK	5		
Students learn to de	esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedd	ed processors, the	ir integrated		
	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.				
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 ad				
	r, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the way		le examine		
	ne linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interestin				
BIE-VR1.21	Virtual reality I	KZ	4		
Introduction to Vir	tual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The c		ne ways of		
	creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social				
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				
	polventy jist konkuren ní výhodou a zhodnotí je bezesporu v pr myslové praxi. Studenti získají znalosti v dynamicky se rozvíjejícím				
	éna na ízení inženýrských a fyzikálních sysém . Poskytneme vám základní informace z oblasti zp tnovazebního ízení lineárních dy				
	ne vás s metodami vytvá ení popisu a modelu systém , základní analýzou lineárních dynamických systém a návrhem a ov ením je egulátor . Pozornost je v nována rovn ž sníma m a ak ním len m v regula ních obvodech, otázkám stability regula ních obvod ,	, ,			
-	etr regulátoru a n kterým aspekt m pr myslových realizací spojitých a íslicových regulátor . Jednotlivá témata p ednášek jsou pro				
nastavovani parani	p íklad a praktických pr myslových realizací.		uzite nych		
BIE-ZRS.21	Basics of System Control	Z.ZK	5		
	n introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It covers ba	, ,	-		
-	namical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear d	-			
-	ion of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of sta	-	-		
-	nd continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digita				
BIE-ZUM	Artificial Intelligence Fundamentals	Z.ZK	4		
-	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic	· · ·	-		
	i-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm				
	be presented as well.				
BIE-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5		
Students are introd	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic	al tasks from the ar	eas of state		
space search, mult	eagent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm	s and the neural ne	etworks, will		
	be presented as well.				
FITE-EHD	Introduction to European Economic History	Z,ZK	3		
The course introdu	ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy	through the descr	iption of the		
	ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro	-			
	re to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial in				
course does not co	over the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, in:	stitutions and orgar	nizations in		
	history. Class meetings will consist of a mixture of lectures and discussions.				
FITE-SEP	World Economy and Business	Z,ZK	4		
	ces students of technical universities to international business. It does that predominantly by comparing individual countries and key	-	-		
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	Z	1		
TVKLV	T lovýchovný kurz	Z	0		
TVV	T lesná výchova	Z	0		
TVV0	T lesná výchova 0	Z	0		
UKCJP	eština pro pokro ilé	Z,ZK	2		
	Kurz pokro ilé eštiny pro ukrajinské studenty, kte í mají status uprchlíka. Zkouška potvrdí znalost eštiny na úrovní B2 s platností r				

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