Study plan

Name of study plan: Bachelor Specialization Computer Networks and Internet, in Czech, 2021

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Informatika Type of study: Bachelor full-time Required credits: 153 Elective courses credits: 27 Sum of credits in the plan: 180 Note on the plan: Tato verze studijního plánu je ur ena pro ro níky, které byly p ijaty ke studiu od akademického roku 2021/2022 do prezen ní formy studia bakalá ského programu. . Garant: Ing. Jan Fesl, Ph.D., email: jan.fesl@fit.cvut.cz Name of the block: Compulsory courses in the program Minimal number of credits of the block: 106 The role of the block: PP Code of the group: BI-PP.21 Name of the group: Compulsory Courses of Bachelor Study Program Informatics, presented in Czech, version 2021 Requirement credits in the group: In this group you have to gain 106 credits Requirement courses in the group: In this group you have to complete 20 courses Credits in the group: 106 Note on the If you plan to profile the specialization Information Security, Management Informatics, Computer Networks and Internet, Computer Systems and Virtualization, Software Engineering, or Web Engineering, enroll in the course group: BI-PSI.21 in your 2nd semester of study. If you plan to profile the specialization Computer Graphics, Computer Engineering, Computer Science, or Artificial Intelligence, enroll in the course BI-PSI.21 in your 4th semester of study. If you plan to profile yourself in the Artificial Intelligence specialization, enroll in the course BI-PST.21 in your 3rd semester of study. Otherwise, enroll in the course BI-PSI.21 in your 5th semester of study. If you plan to profile the specialization Artificial Intelligence or Web Engineering, enroll in the course BI-AAG.21 in your 5th semester of study. Otherwise, enroll in the course BI-PSI.21 in your 3rd semester of study. Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) Algorithms and Graphs 1 BI-AG1.21 5 2P+2C Ζ Z,ZK Dušan Knop, Michal Ople^r, Ond ej Suchý, Tomáš Valla, Radek Hušek **Dušan** PP Knop Dušan Knop (Gar.) Automata and Grammars BI-AAG.21 Z,ZK 5 2P+2C Ζ PP Jan Holub, Jan Janoušek Jan Holub Jan Holub (Gar.) **Bachelor Thesis** BI-BAP.21 Ζ 14 L,Z PP Zden k Muziká Zden k Muziká Zden k Muziká (Gar.) **Bachelor** project Ζ Z.L BI-BPR.21 1 0P+0C PP Zden k Muziká (Gar.) Zden k Muziká Database Systems Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, BI-DBS.21 Z.ZK 5 2P+2R+11 L PP Pavel K íž, Št pán Pechman, Dominik Roudný, Jan Bittner, Ji í Hunka Michal Valenta (Gar.) **Discrete Mathematics and Logic** 2P+1R+1C Ζ BI-DML.21 Z,ZK 5 PP Ji ina Scholtzová, Daniel Dombek, Jan Sp vák **Daniel Dombek** Jan Sp vák (Gar.) **Cryptography and Security** Jvana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, BI-KAB.21 Z,ZK 5 2P+2C L PP

Z,ZK

5

2P+1R+1C

Ζ

PP

Róbert Lórencz Róbert Lórencz (Gar.)

Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda

Linear Algebra 1

(Gar.)

BI-LA1.21

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

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

BI-AG1.21	Algorithms and Graphs 1	Z,ZK	5
The course covers the b	asics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing o	urriculum. It links	and partially
develops the knowledge	from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the	ne time and space	e complexity of
algorithms. The course	also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic nota	tion.	
BI-AAG.21	Automata and Grammars	Z,ZK	5
Students are introduced	to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of fini	ite automata, regu	Ilar expressions,
and regular grammars,	context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know	the hierarchy of fo	ormal languages
and they understand the	relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes I	^D and NP.	
BI-BAP.21	Bachelor Thesis	Z	14
BI-BPR.21	Bachelor project	Z	1
1. At the beginning of th	e semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the	e partial tasks tha	t he / she will
perform during the sem	ester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR	at the end of the	semester. 2. The
external supervisor ente	rs the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.	cvut.cz/student/stu	udijni/formulare).
The completed and sigr	ed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the	topic of the work	that the student
has reserved is formulat	ed more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the a	ssignment so that	t the assignment
can be supplemented a	nd approved at the end of the semester.		
BI-DBS.21	Database Systems	Z,ZK	5
Students are introduced	to the database engine architecture and typical user roles. They are briefly introduced to various database models. They lea	irn to design smal	l databases
(including integrity cons	traints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with	the SQL language	e, as well as with
its theoretical foundation	- the relational database model. They learn the principles of normalizing a relational database schema. They understand the fu	ndamental concep	ots of transaction
processing, controlling	parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduce	ed to special ways	s of storing data
in relational databases	with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of da	atabase systems,	debugging and
optimizing database ap	plications, distributed database systems, data stores.		
BI-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 w	/ill 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 num	per theory, with emphasis on modular arithmetics.		
BI-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 cryptograph	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.	
BI-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 con	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 elir	mination 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 eiger	nvalues and eiger	vectors of a
matrix. We will also dem	ionstrate some applications of these concepts in computer science.		

BI-MA1.21 Mathematical Analysis 1	Z,ZK	5
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numb	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 des	cription of complex	ity of algorithms.
BI-MA2.21 Mathematical Analysis 2	Z,ZK	6
The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will	earn how to integr	ate 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	o the computation	of elementary
functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithm	s, and its analysis	using the Master
theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and	l 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 i	ntegration of multiv	ariate functions.
BI-OSY.21 Operating Systems	Z,ZK	5
In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread	implementations,	race conditions,
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS I	nonitoring. They a	e able to design
and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows.		
BI-PSI.21 Computer Networks	Z,ZK	5
The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in lo	cal 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 nei	work technologies	. Students
practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IO	S.	
BI-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		-
models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-	
estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statis		-
the statistical dependence of two or more random variables.		Ū
BI-PA1.21 Programming and Algorithmics 1	Z.ZK	7
Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple,	1 '	s). expressions.
statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for sea		
with linked lists and trees.	0 , 0 ,	
BI-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	· · ·	-
table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming		-
copying/moving of objects, operator overloading, inheritance, polymorphism).	(* 3 / * 1 * * * *	5 5,
BI-SAP.21 Computer Structure and Architecture	Z.ZK	5
Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of a	, ,	
memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple p	-	
in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.		,
BI-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 computers		-
level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to		
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		
(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.		
BI-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 stude		-
from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use.		nation manager
	V7	3
BI-TDP.21 Documentation and Presentation The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typical	KZ	-
learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically p 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	recent it in front of	
exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.		
		g. Within the
	14 days of teaching	
BI-UOS.21 Unix-like Operating Systems	14 days of teaching	5
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovativ	14 days of teaching KZ e functions of mult	5 user operating
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovativ systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic propular OS today.	A days of teaching KZ e functions of mult perties of this OS f	5 user operating amily, such as
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The role of the block: PS

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

Name of the group: Compulsory courses for specialization Computer Networks and Internet 2021 Requirement credits in the group: In this group you have to gain 40 credits Requirement courses in the group: In this group you have to complete 8 courses Credits in the group: 40 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADU.21	Unix Administration Zden k Muziká , Petr Zemánek, Miroslav Prágl Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	PS
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	z	PS
BI-SIP.21	Network Programming Jan Fesl Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	PS
BI-SPS.21	Administration of Computer Networks and Services Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	PS
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	z	PS
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	PS
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	PS

Characteristics of the courses of this group of Study Plan: Code=BI-PS-PS.21 Name=Compulsory courses for specialization Computer Networks and Internet 2021

BI-ADU.21 Unix Administration	Z,ZK	5
Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles.	1 · · ·	d the differences
between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rigi	hts, file systems, d	lisk 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 th	e lectures on
specific examples from practice.		
BI-APS.21 Architectures of Computer Systems	Z,ZK	5
Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Sp	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	principles 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 the sequential r	nodel of the
program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory c	oherence and con	sistency in such
systems.		
BI-IOT.21 Internet of Things	Z,ZK	5
The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an	overview of senso	rs and actuators,
wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT arch	itectures for different	ent application
areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environment	nts (hardware - AF	RM, ESP, STM;
software - Arduino, Raspberry Pi OS).		
BI-SIP.21 Network Programming	Z	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level prog	yramming using B	SD sockets. The
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middl	leware technologie	es. The final part
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in c	omputer labs using	g a chosen
programming language environment.		
BI-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 administ	rated under the or	perating systems
Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained	d by practical hand	ls-on experience
with real network infrastructure.		
BI-TPS.21 Computer Networks Technologies	Z,ZK	5
The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the phys	sical layer with the	overlap to the
link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies	nologies 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, Eth	nernet, modern wir	reless networks,
always with focus on high-speed networks.		
BI-VDC.21 Virtualization and Data Centers	Z,ZK	5
The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design	and implementation	on of data center
infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data	center technologie	es from private
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud application	s. Students will un	derstand the
design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa	ages, and data los	ses.
BI-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 tech	nologies used in m	nodern computer
networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practi	ical experience with	th real network
devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and securi	ty.	
Name of the block: Compulsory clositive sources		

Name of the block: Compulsory elective courses Minimal number of credits of the block: 5 The role of the block: PV

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

Name of the group: Compulsory elective courses of the specialization Computer Networks and Internet, version 2021

Requirement credits in the group: In this group you have to gain at least 5 credits (at most 15) Requirement courses in the group: In this group you have to complete at least 1 course (at most 3) Credits in the group: 5

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	PV
BI-MSI.21	Mobile Networks Pavel Tvrdík	Z,ZK	5	2P+2C	L	PV
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=BI-PV-PS.21 Name=Compulsory elective courses of the specialization Computer Networks and Internet, version 2021

BI-EHA.21	Ethical Hacking	Z,ZK	5			
The goal of the course i	s to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vu	Inerabilities, and	their possible			
exploitation in computer	exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with					
vulnerabilities testing ar	nd the following process of penetration test documentation.					
BI-MSI.21	Mobile Networks	Z,ZK	5			
The goal of the course i	s to acquaint students with basic principles of mobile networks 4G, 5G, and with multimedia data transfers in these networks	s. Also, students v	vill study the			
principles of smart card	s and their use for authentication of users of mobile networks. The computer labs will be based on simulations of mobile netw	vorks. The course	builds upon			
preceding courses BIE-	PSI and BIE-VPS and completes the overall student's knowledge mainly in the area of high-speed mobile networks.					
BI-ML2.21	Machine Learning 2	Z,ZK	5			
The goal of this course	is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in	particular, learn k	kernel methods			
and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the						
basic principles of reinfo	prcement learning and natural language processing.					

Name of the block: Povinná t lesná výchova, sportovní kurzy Minimal number of credits of the block: 0 The role of the block: PT

Code of the group: BI-PT.21

Name of the group: Compulsory Physical Education, version 2021

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 7) Credits in the group: 0

Note on the group:

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

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

Characteristics of the courses of this group of Study Plan: Code=BI-PT.21 Name=Compulsory Physical Education, version 2021

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

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

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

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

Credits in the group: 2

Note on the group: BI-ANG, ending with an exam for two credits, is enrolled by students who have completed preparator English courses and have a credit from the BI-A2L course.

senrolled by students who prepared for the exam independently and do not have credit from BI-A2L. These students must complete a credit paper before their own exam. After passing the exam, the student will also be recognized for the course BI-ANGS (Independent preparation for the English exam) for 2 credits.

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The BIE-ECC course can be recognized for any active semester after the submission of a external certificate at the level of at least B2 according to the Common European Framework of Reference.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ANG1	English Language Examination without Preparatory Courses Kate ina Valentová Kate ina Valentová Kate ina Valentová (Gar.)	Z,ZK	2	2D	L	PJ
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PJ
BI-ANG	English Language, Internal Certificate Kate ina Valentová Kate ina Valentová Kate ina Valentová (Gar.)	ZK	2	2D	Z,L	PJ

Characteristics of the courses of this group of Study Plan: Code=BI-ZKA.21 Name=English Language Exam

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2		
BIE-EEC	English language external certificate	Z	4		
The BIE-ECC course ca	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 Com	non European Framework of Reference for Languages.				
BI-ANG	English Language, Internal Certificate	ZK	2		
Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG					

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

The role of the block: V

Code of the group: BI-V.2021

Name of the group: Purely Elective Courses of Bachelor Programme Informatics, version from 2021/22 till 2024/25

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-ALO	Algebra and Logic Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era Lud k Ku era (Gar.)	Z,ZK	4	2P+1C	L	V
BI-A2L	English language, preparation for the B2 level exam Kate ina Valentová Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	КZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V

BI-BLE	Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes	Z,ZK	4	2P+1C	L	V
BI-STO	Tomáš Vichta Tomáš Vichta Tomáš Vichta (Gar.) Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	v
NI-PSD	Public Services Design David Pešek, Ond ej Brém David Pešek	KZ	4	1P+2C		v
BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	v
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	V
BI-ANGK	English language, contact preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	Z,L	v
BI-EJA	Enterprise Java Ji í Dan ek	Z,ZK	4	2P+2C	L	v
BI-EJK	Enterprise Java and Kotlin Jií Dan ek Jií Dan ek Jií Dan ek (Gar.)	Z,ZK	4	2P+2C	L	v
BI-FMU	Financial and Management Accounting	Z,ZK	5	2P+2C	Z	v
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Jan ezní ek, Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	v
NI-IAM	Internet and Multimedia Ji í Melnikov	Z,ZK	4	2P+1C	L	v
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	v
BI-CS2	C# language and data access Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	0P+3C	Z	v
BI-CS3	Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	3C	Z	v
BI-SQL.1	Language SQL, advanced Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	v
BI-QAP	Quantum algorithms and programming Tomáš Kalvoda, Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	v
NI-LSM	Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.)	KZ	5	3C	L	v
BI-HAS	Human Aspects in Cryptography and Security Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	v
NI-MPL	Managerial Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.)	ZK	2	2P	Z,L	v
NI-MSI	Mathematical Structures in Computer Science Jan Starý	Z,ZK	4	2P+1C	L	v
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-MIT	Mikrotik technologies Jan Fesl Jan Fesl (Gar.)	KZ	3	1P+2C	Z	v
NI-MOP	Modern Object-Oriented Programming in Pharo Jan Blizni enko Robert Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	v
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-MMP	Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	v
BI-ORL	Operations Research and Linear Programming Dušan Knop Dušan Knop Dušan Knop (Gar.)	KZ	5	1P+2C	L	v
NI-OLI	Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	v
BI-ACM	Programming Practices 1 Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	v
BI-ACM2	Programming Practices 2 Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	Z	v
BI-ACM3	Programming Practices 3 Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	v

BI-ACM4	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
BI-AND.21	Programming for the Android Operating System Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.)	KZ	4	3C	L	V
BI-CS1	Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán (Gar.)	ΚZ	4	3C	L,Z	V
BI-PJV	Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
ві-кот	Programing in Kotlin Jií Dan ek Jií Dan ek Jií Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala Jií Dan ek Jií Dan ek Jií Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.)	Z,ZK	4	2P+2C	Z,L	v
BI-PHP.1	Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-PKM	Introduction to mathematics Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z	4		Z	V
NI-REV	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST2	Network Technology 2 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	3C	L	V
BI-ST3	Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Network Technology 4 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	L	V
BI-SKJ.21	Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2+2	L	V
BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
FIT-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	L	V
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-GIT	Version control system GIT Petr Pulc	KZ	2	16P	Z,L	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVK1	Physical Education	Z	1		L,Z	V
TVV	Luboš Neuman Ji í Drnek (Gar.) Physical education	Z	0	0+2	Z,L	V
TV1	Physical Education	Z	0	0+2	_,_ Z	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2	Physical Education	Z	0	0+2	_,_ L	V
TV2K1	Physical Education 2	Z	1		 L,Z	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
BI-TS1	Theoretical Seminar I Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Dusan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture	KZ		1 1		

NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	ΚZ	4	3C	Z	v
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	v
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	v
BI-ULI	Introduction to Linux Zden k Muziká, Petr Zemánek, Jan Ž árek Zden k Muziká Zden k Muziká (Gar.)	Z	2	4D	Z	v
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	v
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	v
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán Petr Klán (Gar.)	KZ	3	1P+2C	L	V
BI-VAK.21	Selected Applications of Combinatorics Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	v
NI-VYC	Computability Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ZS10	Bachelor internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
BI-ZS20	Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
BI-ZS30	Bachelor internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	v
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	v
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	v
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	ΚZ	4	2C	Z	v
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	v
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V.2021 Name=Purely Elective Courses of Bachelor Programme Informatics, version from 2021/22 till 2024/25

,		7	4
TVK1	Physical Education	Ζ	1
TVV	Physical education	Z	0
TV1	Physical Education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
BI-ADW.1	Windows Administration	Z,ZK	4
This course is pres	ented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	•	
BI-ALO	Algebra and Logic	Z,ZK	4
The course extends	and deepens the study of topics touched upon in the basic course in logic.		
BI-AVI.21	Algorithms visually	Z,ZK	4
The course comple	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute	er science that exte	end substantially
knowledge presente	d in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.c	org <http: td="" www.al<=""><td>govision.org></td></http:>	govision.org>
that make understa	nding the principles of algorithms easy.		

BI-A2L English language, preparation for the B2 level exam	Z	2
The content of the course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievem	1	
active part in the language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
tests with the success rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by		
class of the term.		0
BI-APJ Aplication Programming in Java	Z,ZK	4
This course is presented in Czech. Advanced technologies in Java.	2,21	•
	КZ	5
NI-AFP Applied Functional Programming This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function	1	-
the rise nowadays and the functional paradigm becomes an important construct of traditional programming paradigms. (C++, C#, Java). As such, mas		
necessary competence of a software engineer: the theory and especially the practice.	stering this paradit	JIII Decomes a
	7 71/	4
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 cla		
space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algor	ithms and the neu	ral networks, will
be presented as well.		
BI-BLE Blender	Z,ZK	4
The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those	e interested in 3D	graphics and
animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph	cs applications) co	ourse.
NI-DSP Database Systems in Practes	Z,ZK	4
This course is presented in Czech.	,	
BI-STO Storage and Filesystems	Z,ZK	4
The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and a		-
load balancing and high availability.	aloniving, do oo do	otorago ooanng,
	1/7	4
NI-PSD Public Services Design	KZ	4
The course will introduce students to specifics of UX, Service design and development for public sector. We will look into the design and development	-	
suppliers (devs and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborat	ion with client repr	esentatives.
Course is aimed at students-designers as well as clients.	1	
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 essent	ial 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 applicat	ions. Finally, an inf	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.		
NI-DZO Digital Image Processing	Z,ZK	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical	1 1	e both easy to
implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that	-	-
of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HD		
frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray	-	-
interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a		
NI-DDM Distributed Data Mining		a matting
	k 7	-
	KZ	4
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain han	ds on experience	4 with large scale
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementatio	ds on experience	4 with large scale
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementatio approaches to parallelize other algorithms. The course is prezented in czech language.	ds on experience ns and will be capa	4 with large scale able to propose
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1	ds on experience	4 with large scale
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementatio approaches to parallelize other algorithms. The course is prezented in czech language.	ds on experience ns and will be capa	4 with large scale able to propose
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1	ds on experience ns and will be capa	4 with large scale able to propose
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementatio approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1 The course is taught in Czech.	ds on experience ns and will be capa KZ	4 with large scale able to propose 4 4
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1 The course is taught in Czech. BI-EP2 Efficient Programming 2	ds on experience ns and will be capa KZ	4 with large scale able to propose 4 4
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1 The course is taught in Czech. Efficient Programming 2 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving interview.	ds on experience ns and will be cap KZ KZ Jividual problems a	4 with large scale able to propose 4 4 are discussed,
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation approaches to parallelize other algorithms. The course is prezented in czech language. BI-EP1.24 Effective programming 1 The course is taught in Czech. Efficient Programming 2 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving interview with the aim to choose the best one and avoid implementation errors. BI-ANGK English language, contact preparation for the B2 level exam	ds on experience hs and will be cap KZ KZ dividual problems a	4 with large scale able to propose 4 are discussed, 2
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technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvement in the Pharo Consortium.			-
	technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct inv	olvement in the Pha	ro Consortium.

BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5
	s to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and aug	, ,	isualization on
high resolution displays	(e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mention	oned technologie	s, namely fractal
and procedural visualiz	ation, scientific data visualization, and 3D model scanning.		
BI-MMP This course is presente	Multimedia team project din Czech.	KZ	4
BI-ORL	Operations Research and Linear Programming	KZ	5
-	oduce students to the issues of operational research and primarily to the practical application of linear programming as a func	-	ation technique.
	imarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as ma		
NI-OLI	Linux Drivers	Z,ZK	4
	tem is an important operating system for personal computer and also for embedded systems. Systems on chip and combining of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developme	-	
	dge of Linux operating system architecture, principles of development of various types drivers, including practical experience.		udents. The
BI-ACM	Programming Practices 1	KZ	5
	se for preparing talented student for representation in international programming contests.		U
BI-ACM2	Programming Practices 2	KZ	5
This is a selective cour	be for preparing talented student for representation in international programming contests.	I	
BI-ACM3	Programming Practices 3	KZ	5
This is a selective cour	se for preparing talented student for representation in international programming contests.		
BI-ACM4	Programming Practices 4	KZ	5
	e for preparing talented student for representation in international programming contests.		
BI-AND.21	Programming for the Android Operating System	KZ	4
This course is presente BI-CS1		KZ	4
	Programming in C# s to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental	1	·
-	, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		
	properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggir		
well as work with files a	re emphasized.		
BI-PJV	Programming in Java	Z,ZK	4
This course is presente	d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-PJS.1	JavaScript Programming	KZ	4
e e	is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development		
	nts of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register fo	r this course in th	eir 4th semester
of study. BI-KOT	Programing in Katlin	Z,ZK	4
-	Programing in Kotlin cally-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adva	· .	·
	va compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a		
			-iuncuonal way
	plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		-TUTICUOTIAI WAY
NI-PSL	Plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages). Programming in Scala	Z,ZK	4
-		Z,ZK	4
The course introduces advance standard librar	Programming in Scala	Z,ZK ures - e.g.pattern	4 matching and
The course introduces advance standard librar Scalaz, etc.	Programming in Scala he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featu y. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a	Z,ZK ures - e.g.pattern and libraries e.g. F	4 matching and Play, Cassandra,
The course introduces advance standard librar Scalaz, etc. BI-PMA	Programming in Scala he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featury. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a Programming in Mathematica	Z,ZK ures - e.g.pattern and libraries e.g. F Z,ZK	4 matching and Play, Cassandra, 4
The course introduces advance standard librar Scalaz, etc. BI-PMA Students will be workin	Programming in Scala he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featury. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a Programming in Mathematica g with modern technical and scientific software. Students will learn how to use different programming styles (functional programming styles)	Z,ZK ures - e.g.pattern and libraries e.g. F Z,ZK	4 matching and Play, Cassandra, 4
The course introduces advance standard librar Scalaz, etc. BI-PMA Students will be workin etc.), how to create dyr	Programming in Scala he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featury. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a Programming in Mathematica g with modern technical and scientific software. Students will learn how to use different programming styles (functional program amic interactive applications and visualisations, data processing and presentations.	Z,ZK ures - e.g.pattern and libraries e.g. f Z,ZK mming, rule-base	4 matching and Play, Cassandra, 4 d programming,
The course introduces advance standard librar Scalaz, etc. BI-PMA Students will be workin etc.), how to create dyr BI-PHP.1	Programming in Scala he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featury. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a Programming in Mathematica g with modern technical and scientific software. Students will learn how to use different programming styles (functional program amic interactive applications and visualisations, data processing and presentations. Programming in PHP	Z,ZK ures - e.g.pattern and libraries e.g. f Z,ZK mming, rule-base KZ	4 matching and Play, Cassandra, 4 d programming, 4
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		· ·
BI-SCE2 Computer Engineering Seminar II		4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistant are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of		
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 te		
semester.		
BI-ST1 Network Technology 1	Z	3
The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acred	ited under the Cisc	o Netacad -
CCNA1 - R&S Introduction to Networks.	7	2
BI-ST2 Network Technology 2 This course is presented in Czech.	Z	3
BI-ST3 Network Technology 3	7	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented due	. –	-
get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pr	edictability, extensi	ion beyond a
simple topology, security, etc.		-
BI-ST4 Network Technology 4	Z	3
Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switcl BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased e		-
beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete		-
Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and sw		-
recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mit	gation ways while	maintaining the
BI-SKJ.21 Scripting Languages Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In a	ddition they gain a	4
into shell and some other particular scripting languages and will get practical experience with shell script programming.	uullon, mey gain a	deeper maight
BI-SOJ Machine Oriented Languages	Z,ZK	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optim	1 '	cessor's features
and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of vi	ew linked to higher	level languages.
This knowledge will be used during reverse engineering, optimization, and evaluation of code security.		
FIT-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly land key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as w		
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form		
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly business are consistent of the course introduces students of technical university to the international business.		
and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as w		
corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	of discussions bas	sed on individual
NI-SYP Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge		-
of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
BI-GIT Version control system GIT	KZ	2
Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and peven the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git serve		articular system
BIE-SEG Systems Engineering	7	0
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principle	s of operating syst	-
to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After ta		
understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what of	oncurrency is, as c	opposed to
parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		1
TV2K1 Physical Education 2	Z	1
BI-TS1 Theoretical Seminar I	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cl are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course		
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS2 Theoretical Seminar II	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cl	assical reading gro	oup. The students
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course	is a work with scie	ntific papers and
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cl		4
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course		-
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS4 Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a cl		-
are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course	is a work with scie	ntific papers and
other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	K7	4
BI-TDA Test driven architecture The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that	KZ t are well known in	1 -
world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occu		-
NI-TSP Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to	1 '	-
the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with the sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with the sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with the sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with the sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with the sensitization and to use an ATPG for automatic test generation.	th built-in-self-test	equipment. They
will be able to compute, analyze, and control the reliability and availability of the designed circuits.		

BI-QUA Quality Assurance	KZ	4
This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context	I I	of software
development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student sho		
analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found	in the product ur	nder test.
FI-TOP Academic writing	Z	2
Publishing is an important and required part of research activity. It is not only about obtaining research results but also about applying them in the fo	rm of publication.	Writing scientific
publications can be useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the o	-	-
write a scientific article, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting		
else's article. The course will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester.		-
on the availability of enrolled students.		
BI-CCN Compiler Construction	Z,ZK	5
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle:		-
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme		51000113 10
		4
BI-TEX TeX and Typography	Z,ZK	4
This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of t	ine course focuse	s on typographic
rules.		
BI-EHD Introduction to European Economic History	Z,ZK	3
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-KSA Cultural and Social Anthropology	ZK	2
The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the dive	rsity of the world	- examples from
anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	ealth, history, deat	th, etc) will be
shown. The course is presented in Czech.		
BI-ULI Introduction to Linux	Z	2
Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom	ie familiar with ba	
and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).		
BI-OPT Introduction to Optical Networks	Z,ZK	4
Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on p	1 ' 1	
	•	
of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive component		•
dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sy	,	
the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such		
ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters	3. Students will so	ive real tasks
from practice.		
NI-VCC Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	d organizations. T	hey will get
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to effi	iciently operate ar	nd optimize the
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology to	day for the
management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical ski	lls in the use of mo	odern integration
and development tools (Continuous integration and development).		
BI-VHS Virtual game worlds	ZK	4
The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current s	students knowled	ge is furthermore
complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world	. The course can	be followed by
the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.		
BI-VR1 Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirement	1 1	•
The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves of		
and shared social activities.		king, empany
	1/7	0
BI-VR2 Virtual reality II	KZ	3
Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The c	bjective is to deve	elop applications
for computer science and gamification in various social metaverse and desktop engines.		
BI-VAK.21 Selected Applications of Combinatorics	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	e basic courses,	we approach the
issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	asic data structure	es. Furthermore,
with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical)	informatics. Areas	from which we
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optim	ization and more.	Students will
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		
BI-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		eries and their
properties. Further, we 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.		
NI-VYC Computability	Z,ZK	4
Classical theory of recursive functions and effective computability.	<i>ב</i> , <i>ב</i> ו <i>\</i>	н т
		40
BI-ZS10 Bachelor internship abroad for 10 credits	Z	10
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or		
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content. The student must provide evidence of the professional content.		
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits		
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	a into two subjects	s if the internship
exceeds the academic year's dead-line.		
BI-ZS20 Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or		
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content.	sional content and	d extent of the
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits	correspond to 4 v	veeks of full-time
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	d into two subjects	if the internship
exceeds the academic year's dead-line.		

BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
Each student can once	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or	research institutio	n. Before the
internship the Dean of the	he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content.	sional content and	extent of the
internship. Auxiliary cou	rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits	correspond to 4 w	eeks of full-time
employment with a forei	gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	d into two subjects	if the internship
exceeds the academic y	vear's dead-line.		
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded sy	stem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim	of the course is to	teach students
modern humanoid robot	control and development of applications in a graphical development environment. Lectures provide fundamentals of motion c	ontrol, sensor rea	ding, application
interfaces, robot navigat	tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to g	et practical experi	ence with these
technologies.			
BI-ZPI	Process engineering	KZ	4
Students will learn fund	amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles	of process model	ing and they will
learn basics of the used	notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of I	ousiness processe	es using modern
CASE tools. The role of	process engineering for information systems development is discussed as well as its importance in the overall context of info	ormation and busi	ness strategy of
an enterprise.			
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain the ba	sics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech	n popular framewo	ork. The resulting
knowledge should serve	ofor the efficient creation of a web backend in PHP language.		
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented	d in Czech.		
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presented	d in Czech.		
BI-3DT.1	3D Printing	KZ	4

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

Name of the group: Elective Vocational Courses for a Bachelor Specialization BI-PS.21, version 2021 Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADU.21	Unix Administration Zden k Muziká, Petr Zemánek, Miroslav Prágl Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	V
BI-AWD.21	Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-AG2.21	Algorithms and Graphs 2 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	V
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	z	V
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	V
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	V
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-FBI.21	Financial Business Intelligence David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-HWB.21	Hardware Security Ji í Bu ek Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-JPO.21	Computer Units Pavel Kubalik Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B lohoubek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-LA2.21	Linear Algebra 2 Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	V
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V

BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	V
FIT-ITI	Modern IT infrastructure	Z,ZK	5	2P+1C	Z,L	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MGA.21	Multimedia and Graphics Applications Ji í Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PGR.21	Computer graphics programming Petr Felkel, Jaroslav Sloup Jaroslav Sloup Petr Felkel (Gar.)	Z,ZK	5	2P+2C	L	V
BI-PRS.21	Practical Statistics Kamil Dedecius, Petr Novák Petr Novák Petr Novák (Gar.)	KZ	5	1P+2C	L	V
BI-PNO.21	Practical Digital Design Martin Novotný Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	V
BI-PAI.21	Law and Informatics Zden k Ku era, Št pánka Havlíková, Dominik Vítek, Martin Samek, Ji í Maršál, Michal Mat jka Št pánka Havlíková Zden k Ku era (Gar.)	ZK	5	2P+2C	L	V
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	V
BI-PPA.21	Programming Paradigms Jan Janoušek, Tomáš Pecka, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	V
BI-PGA.21	Programming of Graphic Applications Ji (Chludil, Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	V
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	v
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BI-SWI.21	Software Engineering Michal Valenta, Ji í Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	V
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	V
BI-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Ji í Mlejnek Ji í Mlejnek (Gar.)	ΚZ	5	2C	Z	V
BI-SPS.21	Administration of Computer Networks and Services Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	V
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	V
BI-SVZ.21	Machine vision and image processing Marcel Ji ina, Jakub Novák, David Kramný, Justýna Frommová Jakub Novák Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	V
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Jaroslav Borecký Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TAB.21	Applications of Security in Technology Ji í Dostál, Jan B lohoubek, Martin Kolárik, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BI-TJV.21	Java Technology Stanislav Kuznetsov, Jan Blizni enko, Ji í Dan ek, Raian Samerkhanov Ji í Dan ek	Z,ZK	5	2P+2C	Z	V
BI-TIS.21	Information Systems Pavel Náplava Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-TUR.21	User Interface Design Jan Schmidt Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	V
BI-TWA.21	Design of Web Applications David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-IDO.21	Introduction to DevOps Michal Valenta, Ji í Mlejnek, Tomáš Vondra, Zden k Rybola Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B lohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák David Pokorný Jan B lohoubek (Gar.)	Z,ZK	5	3P+1C	Z	V
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	V

BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	V
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	V
BI-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal Ji í Novák Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	L	V
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZSB.21	Basics of System Security Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-PS-VO.21 Name=Elective Vocational Courses for a Bachelor Specialization BI-PS.21, version 2021

BI-ADU.21 Unix Administration	Z,ZK	5
Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles.	1 1	-
between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rig	-	
processes, memory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the		
specific examples from practice.		
BI-APS.21 Architectures of Computer Systems	Z,ZK	5
Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Sp	1 ' 1	-
pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the	-	-
not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness		
program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory of	-	
systems.		
BI-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 administ	rated under the or	berating systems
Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gaine	d by practical hand	ls-on experience
with real network infrastructure.		
BI-VDC.21 Virtualization and Data Centers	Z,ZK	5
The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design	and implementation	on of data center
infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data	center technologie	es from private
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud application	s. Students will un	derstand the
design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, out	ages, and data los	ses.
BI-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 tech	1 1	nodern computer
networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining pract	-	-
devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and secur		
BI-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, vi	1 1	heir possible
exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus		
vulnerabilities testing and the following process of penetration test documentation.		
BI-ML2.21 Machine Learning 2	Z,ZK	5
The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in		-
and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction me	-	
basic principles of reinforcement learning and natural language processing.	,	U
BI-MPP.21 Methods of interfacing peripheral devices	Z,ZK	5
The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Univ	1 1	-
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of		
drivers, simple application development, and APIs of selected devices.		
BI-MVT.21 Modern Visualisation Technologies	Z,ZK	5
The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and a	1 2 1	-
high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the men		
and procedural visualization, scientific data visualization, and 3D model scanning.		-,
BI-AWD.21 Web and Database Server Administration	Z,ZK	5
Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a	1 1	-
web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example o		
	1	F
BI-AG2.21 Algorithms and Graphs 2 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compuls		5 21. It further
delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For E		
BIE-AG2.21.		10 000100 000
	774	E
	Z,ZK	5 PSI with actual
The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gas security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finish		
knowledge of security applications in computer networks.	ing the course stud	aont win get
internedge of occurry applications in compation networks.		

BI-BEK.21 Secure Code	Z,ZK	5
The students will learn how to assess security risks and how to take them into account in the design phase of the	neir own code and solutions. After getting familiar with the	threat modeling
theory, students gain practical experience with running programs with reduced privileges and methods of spec		
administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be		•
security and database systems, web, remote procedure calls, and sockets in general. The module concludes w		
BI-BIG.21 DB Technologies for Big Data	KZ	5
Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engine		-
finishing the course students were able to choose suitable tools (mostly open source) and techniques, design a		
collection, transformation/aggregation, presentation). Students get acquainted with various architectures for pr of individual technologies will be supplemented with specific examples from practice.	ocessing and storing big data. A theoretical foundation a	and presentation
	771/	<i>r</i>
BI-EPP.21 Economic Business Processes	Z,ZK	5
The aim of the course is to present typical processes related to the usual life cycle of a company. The course f in the market environment of the Czech Republic and the basics of management. In the course, students are a		
establishment of the company, through the management of property and capital structure, financing of the cor		
evaluating the financial health of the company and its eventual rehabilitation or termination.		
BI-FBI.21 Financial Business Intelligence	Z,ZK	5
The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business	· · · · · · · · · · · · · · · · · · ·	÷
and other indicators for comparison with other companies and management decision process at the tactical a		-
for financial management and prediction of business development. Management accounting allows monitoring		-
accounting periods, enables a multidimensional view of business data, enables to control effectively factors af	·	
assess options related to future business decisions. The principles of management accounting, described in the	his course, are the basis of Business Intelligence module	es in business
information systems, decision support systems, and other knowledge-oriented systems.		
BI-HWB.21 Hardware Security	Z,ZK	5
The course deals with hardware resources used to ensure security of computer systems including embedded on	es. Students become familiar with the operating principles	of cryptographic
modules, security features of modern processors, and storage media protection through encryption. They will gain	n knowledge about vulnerabilities of HW resources, includ	ing side-channel
attacks and tampering with hardware during manufacture. Students will have an overview of contact and conta	actless smart card technology including applications and	l related topics
for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ci	phers.	
BI-JPO.21 Computer Units	Z,ZK	5
Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the progr	ram (BIE-SAP), get acquainted in detail with the internal	structure and
organization of computer units and processors and their interactions with the environment, including accelerati	ing arithmetic-logic units and using appropriate codes for	rimplementation
of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and		
correction for parallel and serial data transmissions. They will also get acquainted with the methodology of con		-
the environment and the architecture of the bus system. The problems will be practically evaluated in the labs ar	nd with the help of the educational microprogrammed pro-	cessor simulator
and programmable hardware design kits (FPGA).		
BI-KOM.21 Conceptual Modelling	Z,ZK	5
The course is focused on developing abstract thinking and precise formulation skills using conceptual models.		-
L categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions		
	. Students learn basics of ontological structural modeling	
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati	ons of OWL/RDF semantic data representation in the Int	ternet. They also
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in	ons of OWL/RDF semantic data representation in the Int nstitutes and their processes. The DEMO method and the	ternet. They also
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in will be taught. The course is designed with the respect to continuation in software implementations. Recomme	ons of OWL/RDF semantic data representation in the Internet institutes and their processes. The DEMO method and the inded optional follow-up course: BI-ZPI.	ternet. They also BPMN notation
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in will be taught. The course is designed with the respect to continuation in software implementations. Recomme BI-LA2.21 Linear Algebra 2	ons of OWL/RDF semantic data representation in the Int nstitutes and their processes. The DEMO method and the ended optional follow-up course: BI-ZPI.	ternet. They also BPMN notation 5
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in will be taught. The course is designed with the respect to continuation in software implementations. Recomme BI-LA2.21 Linear Algebra 2 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form in	ons of OWL/RDF semantic data representation in the Int nstitutes and their processes. The DEMO method and the inded optional follow-up course: BI-ZPI. Z,ZK	ternet. They also e BPMN notation 5 ní obecné form .
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notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in will be taught. The course is designed with the respect to continuation in software implementations. Recomme BI-LA2.21 Linear Algebra 2 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form in	ons of OWL/RDF semantic data representation in the Int nstitutes and their processes. The DEMO method and the ended optional follow-up course: BI-ZPI. Z,ZK -tic ísel. Zde si zavedeme vektorový prostor v abstraktr ní algebrou, geometrií a po íta ovou grafikou. Dalším ve	ernet. They also BPMN notation 5 ní obecné form . Ikým tématem
notation. Next, they learn how to express business rules and constraints using the OCL language and foundati learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and in will be taught. The course is designed with the respect to continuation in software implementations. Recomme BI-LA2.21 Linear Algebra 2 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form in Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineárn bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a mož Ukážeme si také aplikace lineární algebry v r zných oborech.	ons of OWL/RDF semantic data representation in the Int nstitutes and their processes. The DEMO method and the inded optional follow-up course: BI-ZPI. Z,ZK -tic ísel. Zde si zavedeme vektorový prostor v abstraktr ní algebrou, geometrií a po íta ovou grafikou. Dalším ve źnosti, jak se s tímto problémem vypo ádat s d razem na	ternet. They also BPMN notation 5 ní obecné form . Ikým tématem a rozklady matic.
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		n
BI-PNO.21 Practical Digital Design	KZ	5
Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand	the basics of the	/HDL language
and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using moder		
	Thiddolfy Standard	a one acoign
tools.		1
BI-PAI.21 Law and Informatics	ZK	5
The aim of the course is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledg	e of doing busines	s in the Czech
Republic and will be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding	•	
environment, will know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be ab		
and open-source licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protect	-	
will also be alerted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses	of real cases from	practice.
BI-PJP.21 Programming Languages and Compilers	Z,ZK	5
Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers	1 1	-
		-
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	on. The compiler ca	an translate not
only a programming language but any text in a language generated by a given LL input grammar.		
BI-PPA.21 Programming Paradigms	Z,ZK	5
The course deals with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of		-
programming paradigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programmin		
on lambda calculus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern ma	instream programn	ning languages
such as C++ and Java.		
BI-PGA.21 Programming of Graphic Applications	Z,ZK	5
		-
The course will present the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and		
data (3D scenes, mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both usi	ng built-in scripting	languages and
by implementation of plugins.		
BI-PJS.21 JavaScript Programming	KZ	5
		-
The course is an introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code devi	-	-
BI-PYT.21 Python Programming	KZ	5
The aim of the course is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary of	data processing. Th	ne differences
between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the for	mat of a Jupyter n	otebook which
enables greater accent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a seme		
	SIEL WOLK WILL DE AS	ssigned during
the semester.		
BI-PRR.21 Project management	Z,ZK	5
The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, a	nalvsis. crisis mar	agement in a
project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risl	-	-
		-
Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for		
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.		
BI-SWI.21 Software Engineering	Z,ZK	5
Students get acquainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. The	· · · ·	-
	-	
their knowledge during the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get ha		
using the visual language UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture designed and solving software problems.	gn and testing. Wit	thin the course,
students also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their developmer	nt.	
BI-SP1.21 Team Software Project 1	KZ	5
Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in t	1	-
concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The t		
project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	e artefact will be fu	irther developed
and finished in the BIE-SP2 course.		
BI-SP2.21 Team Software Project 2	KZ	5
		1
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the re-		
However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will w	ork in teams of 4-6	6 people. The
teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their	solution.	
BI-ML1.21 Machine Learning 1	Z,ZK	5
	1 1	1
The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working		
classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relation	•	
variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimens	ional data visualiza	ation. In practical
demonstrations, pandas and scikit libraries in Python will be used.		
BI-SVZ.21 Machine vision and image processing	Z,ZK	5
		1
Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluation of the system of the sy	-	
introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical	use of camera sys	stems for solving
problems of practice that the graduates may encounter.		
BI-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 iss		-
		-
lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the la	b are the same as	III IIIE BIE-VES
course.		
BI-TAB.21 Applications of Security in Technology	Z,ZK	5
The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Si		-
	got a billat	
cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.		1
BI-TJV.21 Java Technology	Z,ZK	5
The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and	experience with li	braries and tools
from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.		

BI-TIS.21 Information Systems	Z,ZK	5
The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the c	1 '	-
"on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and oth		
The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa		
implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analy	-	-
decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information	-	
At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems to		
BI-TUR.21 User Interface Design	Z,ZK	5
Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where sof	1 '	-
communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students		
bring users into the development process to ensure optimal interface for them.	gamanorennen	
BI-TWA.21 Design of Web Applications	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some proper		-
structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web application		
modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Sym		
on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React.		
BI-IDO.21 Introduction to DevOps	Z,ZK	5
The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of	· · ·	-
covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and b	-	
the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acqua	• • • •	•
used in practice.		
BI-UKB.21 Introduction to Cybersecurity	Z,ZK	5
The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic	1 '	-
and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.	Sverview of threat	
BI-VES.21 Embedded Systems	Z,ZK	5
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and emb	1 .	-
peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		,
BI-VIZ.21 Data Visualization	KZ	5
The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understa		-
application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preproce	-	
different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications		-
examples in the Python programming language.		
BI-VWM.21 Searching the Web and Multimedia Databases	Z,ZK	5
Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous stor	· · ·	-
students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction fro	-	-
knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming we		
data types (documents).	· · · · · · · · · · · · · · · ·	
BI-FEM.21 Fundamentals of Economics	Z,ZK	5
The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management	1 1	-
of fundamental microeconomic and macroeconomic topics.	sine in containio a g	
BI-ZRS.21 Basics of System Control	Z,ZK	5
The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will for		-
control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, descrip		
basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of c		
model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also give		-
control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the indust		
and digital controllers and PLC control.	na implementatio	
BI-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 fore		-
such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of mo		
as well as skills needed for independent work in the area of operating system security incident analysis.	serie operating by	contro coounty,
BI-ZUM.21 Artificial Intelligence Fundamentals	Z,ZK	5
Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques ne		-
especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also		
as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the		-

List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A2L	English language, preparation for the B2 level exam	Z	2
active part in the l	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement - anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the second s	ne midterm and the	final term
tests with the succe	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi	ividual teachers du	ring the first
	class of the term.		

	Automata and Grammars	Z,ZK	5
and regular gramma	iced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite a	-	-
and the	ars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the y understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity		
BI-ACM	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		5
BI-ACM2	Programming Practices 2	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		1 -
BI-ACM3	Programming Practices 3	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM4	Programming Practices 4	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		. <u> </u>
BI-ADU.21		Z,ZK	5
	ie internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They dministrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,		
	ry, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the know	-	-
	specific examples from practice.	smouge nom no i	
BI-ADW.1	Windows Administration	Z,ZK	4
1	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	, ,	I
BI-AG1.21	Algorithms and Graphs 1	Z,ZK	5
	s the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cu		
	edge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the		omplexity of
	ithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic mathematics in particular, the asymptotic mathematics are asymptotic mathematics.		1
BI-AG2.21	Algorithms and Graphs 2	Z,ZK	5
	ented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory		
delves into advanc	es data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Eng BIE-AG2.21.	ish version of the	course see
BI-ALO	Algebra and Logic	Z,ZK	4
DI-ALO	The course extends and deepens the study of topics touched upon in the basic course in logic.	ζ_Λ	+
BI-AND.21	Programming for the Android Operating System	KZ	4
BIT I I BILL I	This course is presented in Czech.		
BI-ANG	English Language, Internal Certificate	ZK	2
1	Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN		1
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
The content of the c	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement	students are due	to: -Take ar
•	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the		
ests with the succes	ss rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind	vidual teachers du	iring the firs
	class of the term.		
	Antion Drogramming in Joyo	7 71/	4
BI-APJ	Aplication Programming in Java	Z,ZK	4
- 1	This course is presented in Czech. Advanced technologies in Java.	, , ,	, - ,
BI-APS.21	This course is presented in Czech. Advanced technologies in Java. Architectures of Computer Systems	Z,ZK	5
BI-APS.21 Students will learn	This course is presented in Czech. Advanced technologies in Java.	Z,ZK	5 ven on the
BI-APS.21 Students will learn	This course is presented in Czech. Advanced technologies in Java. Architectures of Computer Systems the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec	Z,ZK cial emphasis is giv	ven on the
BI-APS.21 Students will learn bipelined instruction not only in scalar	This course is presented in Czech. Advanced technologies in Java. Architectures of Computer Systems the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of RISC and CISC architectu	Z,ZK cial emphasis is giv ciples of instruction the sequential mo	5 ven on the processin odel of the
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BI-BIG.21 DB Technologies for Big Data KZ Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practifinishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of dat collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation of individual technologies will be supplemented with specific examples from practice. BI-BLE Z,ZI The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applicat BI-BPR.21) Bachelor project Z 1. At the beginning of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the partial tasks Z	ctically so	5
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perform during the competent to proceed the appingment. If he completes these tasks, the supervisor will sword him a credit from the subject PL PDP at the and of the	that he	/ she will
perform during the semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at the end of the	e semes	ster. 2. The
external supervisor enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/student	studijni/f	formulare).
The completed and signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the topic of the we	ork that th	he student
has reserved is formulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assignment so t	hat the a	ssignment
can be supplemented and approved at the end of the semester.		
BI-CCN Compiler Construction Z,Z	<	5
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compiler	s for stur	dents to
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the		
BI-CS1 Programming in C# KZ		4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction,		-
operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and c		
constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and except well as work with files are emphasized.	on proce	essing, as
BI-CS2 C# language and data access KZ		4
The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform		
get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such		
of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects)		
and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domai		-
(ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage N	odel and	d Mapping
(XML description).		
BI-CS3 Language C# - design of web applications KZ		4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development	pmentp	ossibilities
on thisplatform. They will learn to create WebAPI and to use it by client programs.		
BI-DBS.21 Database Systems Z,Z	<	5
Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design		-
(including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language		
its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental cond	-	
processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special w		
in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database system	•	°
optimizing database applications, distributed database systems, data stores.	10, 0000	gging and
BI-DML.21 Discrete Mathematics and Logic Z,ZI		5
Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theor		-
Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays	Jown the	a dasics of [
combinatorics and number theory, with emphasis on modular arithmetics.	X	
BI-EHA.21 Ethical Hacking Z,Z		5
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	information systems, decision support systems, and other knowledge-oriented systems.		
BI-FEM.21	Fundamentals of Economics	Z,ZK	5
The course allows	the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. of fundamental microeconomic and macroeconomic topics.	It contains a gene	eral overview
BI-FMU	Financial and Management Accounting	Z,ZK	5
	rse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the pa		
	unts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modificatio ations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manage		
or economic oper	Business Inteligence moduls in Business information systems.		ale base of
BI-GIT	Version control system GIT	KZ	2
	roduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pract	tically. In this partio	cular system
	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git	server administrat	1
BI-GIT.21	SW Development Technologies	Z	3
I his course is aime	ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students t from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use		tion manager
BI-HAM	HW accelerated network traffic monitoring	KZ	4
	duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The	1	
	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a s		
for analysis). The g	oals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traff	fic on a hardware	and software
BI-HAS	level and to develop their practical abilities in this field. Human Aspects in Cryptography and Security	Z,ZK	5
	students interested not only in technical scope of computer science, but also in making products usable - for users and for developer		
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
	This course is presented in Czech.		
BI-HWB.21	Hardware Security	Z,ZK	5
	ith hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the opera eatures of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW re-		
-	ring with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including a	-	
	for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers.		
BI-IDO.21	Introduction to DevOps	Z,ZK	5
	rith the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of sys		
	support software development, testing and compilation. It also focuses on tools for automating infrastructure management and build introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquain		
	used in practice.		- - - - - - - - - -
	doed in placifice.		
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
		1	1
BI-IOT.21	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech. Internet of Things	Z,ZK	5
BI-IOT.21 The course focuses	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech. Internet of Things on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an over	Z,ZK	5 nd actuators,
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assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business

the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenvalues and eigenvectors of a matrix. We will also demonstrate some applications of these concepts in computer science.

matrix. We will also demonstrate some applications of these concepts in computer science.		
BI-LA2.21 Linear Algebra 2 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový pro	Z,ZK stor v abstraktní obe	5 ecné form .
Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou gra bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo áda	fikou. Dalším velkým	n tématem
Ukážeme si také aplikace lineární algebry v r zných oborech.		dauy matic.
BI-LOG.21 Mathematical Logic	Z,ZK	5
The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability		
logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are		
vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness the		· .
BI-MA1.21 Mathematical Analysis 1	Z,ZK	5
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers.	1 1	
and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions	-	
is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and	d solution of simple o	optimization
problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical descrip	tion of complexity of	algorithms.
BI-MA2.21 Mathematical Analysis 2	Z,ZK	6
The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will lear	n how to integrate b	y parts and
use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to t	•	
functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and	, ,	
theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and		-
analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of local extrema of multivariate functions as well as the numerical descent method.		
BI-MDF.21 Modern Data Formats	KZ	3
The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type and data type along with tools available to work with such data. After finishing the course, the students should know how to work with common data type along with tools available to work with such data.		
BI-MGA.21 Multimedia and Graphics Applications	Z,ZK	5
Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wo	king with images, v	ideos, 3D
graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to gra	phic formats, and co	ompression
technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the		on and use
of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating	3D models.	
BI-MIT Mikrotik technologies	KZ	3
The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are con		
middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the m		
and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer n	etworks concepts lik	le protocois
and technologies of the data-link, network and transport layer of the OSI model.	776	5
and technologies of the data-link, network and transport layer of the OSI model. BI-ML1.21 Machine Learning 1	Z,ZK	5 sion and
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BI-ORL	Operations Research and Linear Programming	KZ	5
-	to introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundar		-
	onal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (suc	-	-
BI-OSY.21	Operating Systems	Z,ZK	5
	s a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS moni		
chica regions, in	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W	• •	ie to design
BI-PA1.21	Programming and Algorithmics 1	Z,ZK	7
Students gain the	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, strue		xpressions,
statements, funct	ions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchi	ing, sorting, and ma	anipulating
	with linked lists and trees.	774	7
BI-PA2.21 Students know the	Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	Z,ZK	7 rav list set
	in these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e	-	-
	copying/moving of objects, operator overloading, inheritance, polymorphism).	sigi, template prog.	, ann an
BI-PAI.21	Law and Informatics	ZK	5
	burse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge of		
	ill be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding co		
	know their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to		
	licenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection a rted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses of	•	
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
	esent the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their	1 ' 1	
	mathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using b		
	by implementation of plugins.	1 0 0	5 0
BI-PGR.21	Computer graphics programming	Z,ZK	5
After attending this	curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the	e scene, add textur	es imitating
-	and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and ter		
	pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representi	-	-
	ppment, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surface		
BI-PHP.1	Programing in PHP aught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a	KZ	4
	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register i		
	register for this course in their 3rd semester of study.		,
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
Students learn b	asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G	NU and LLVM. The	ey learn to
create a specifica	tion of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. T	The compiler can tra	anslate not
	only a programming language but any text in a language generated by a given LL input grammar.		4
BI-PJS.1	JavaScript Programming	KZ KZ	4
-	course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the students of BIE-WSI-WI.2015 branch of students and the students and the students of BIE-WSI-WI.2015 branch of students and the students of BIE-WSI-WSI-WI.2015 branch of students and the st	-	
	of study.		
BI-PJS.21	JavaScript Programming	KZ	5
	n introduction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code develo	opment in Javascri	pt easier.
BI-PJV	Programming in Java	Z,ZK	4
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-PKM	Introduction to mathematics	Z	4
	This course is presented in Czech.		
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be w	orking with modern technical and scientific software. Students will learn how to use different programming styles (functional programn etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	hing, rule-based pro	ogramming,
BI-PNO.21	Practical Digital Design	КZ	5
	verview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the	1 1	-
-	ion technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern in		
	tools.		
BI-PPA.21	Programming Paradigms	Z,ZK	5
	with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of par		
	digm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The		
	is and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstr such as C++ and Java.	ean programming	languages
BI-PRR.21	Project management	Z,ZK	5
	burse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, ana	1 ' 1	
	cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as		
Gantt charts, res	ource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st	udents who are int	erested in
deepening their l	nowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar	rge companies. The	e course is
	also suitable for all those who will develop software or hardware in the form of team projects.	·	_
BI-PRS.21	Practical Statistics	KZ	5
	e introduced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose mode egression and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical software	-	
	methods on data from real problems.		

BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a ge	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additi	on, they gain a dee	eper insight
	into shell and some other particular scripting languages and will get practical experience with shell script programming.		
BI-PSI.21	Computer Networks	Z,ZK	5
	ices students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local r		
	es will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw actically verify configurations and management of network devices in the lab within the environment of the operating systems Linux a	•	Students
BI-PST.21			5
	Probability and Statistics the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T	Z,ZK	-
	om variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-	
	known distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistica	-	-
	the statistical dependence of two or more random variables.		-
BI-PYT.21	Python Programming	KZ	5
The aim of the co	burse is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data	a processing. The c	differences
	hy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format		
enables greater a	ccent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester the semester.	work will be assig	ned during
BI-QAP		KZ	5
	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, o		-
-	gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developr		-
	ge. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMN		
	might be an advantage. No previous knowledge of physics is assumed.		
BI-QUA	Quality Assurance	KZ	4
	duces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context		
	will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should		
	n a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found	-	
BI-SAP.21	Computer Structure and Architecture	Z,ZK	5
	acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arith nunication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple proce		
	in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools.		npiomoniou
BI-SCE1	Computer Engineering Seminar I	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	failures and attacl	ks. Students
are approached in	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	subject is work wi	th scientific
articles and other p	professional 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 n	new for each
	semester.		1
BI-SCE2	Computer Engineering Seminar II	Z	4
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The Seminar of Co are approached in	Computer Engineering Seminar II mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to adividually 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	subject is work wi	ks. Students
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BI-SQL.1	Language SQL, advanced	KZ	4
	n knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa		
	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of		
	lexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan an ad. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora	-	-
	PostgreSQL.	cie DBMS and par	ually Off
BI-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.		
lectures will be exp	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are	e the same as in th	e BIE-VES
	course.		
BI-ST1	Network Technology 1	Z	3
I ne subject is or	riented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited CCNA1 - R&S Introduction to Networks.	a under the Cisco h	vetacad -
BI-ST2	Network Technology 2	Z	3
DIGIZ	This course is presented in Czech.	-	Ũ
BI-ST3	Network Technology 3	Z	3
Students will furthe	er enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during B	I-ST1 and BI-ST2	courses will
get further exten	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predi	ctability, extension	beyond a
	simple topology, security, etc.		
BI-ST4	Network Technology 4		3
	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici		
-	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely		
, ,	le Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch		•
recoveries, and er	nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation	on ways while main	taining the
	network running.		
BI-STO	Storage and Filesystems	Z,ZK	4
The student will lea	arn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi	ving, as so as stora	age scaling,
DI DI /T di	load balancing and high availability.		
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
-	are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate ir s to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use	-	
introduces students	problems of practice that the graduates may encounter.	of camera systems	s for solving
BI-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		-
	ring the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-c		
using the visual la	nguage UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design a	nd testing. Within t	he course,
	udents also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their	development.	
BI-TAB.21	Applications of Security in Technology	Z,ZK	5
The goal of the co	burse is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stude	-	verview of
	cybersecurity applications and extend their knowledge from the cryptology, the secure code, and system, network, and hardware	-	4
BI-TDA	Test driven architecture cused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that ar	KZ	4 DovOps
	burse has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occu		-
BI-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	1	
learn to create text	of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese	nt it in front of class	smates and
the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the			
exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.			
BI-TEX	TeX and Typography	Z,ZK	4
This course is pres	sented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the o	course focuses on t	typographic
	rules.	7 71/	<i>г</i>
BI-TIS.21	Information Systems purse is to familiarise students with the information systems topic and information systems implementation principles. During the cours	Z,ZK	5 roducod to
-	xisting types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other to		
	tal part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa		-
implementation an	d information system implementation based on the project management principles. The emphasis is on the initial customer analysis,	customer insight ar	nd ability to
	s better to implement any existing information system or to develop a new one from scratch. These factors determine the information sy	•	
	of the course information systems security, operation, support, maintenance, legislation impacts, and government information system	-	
BI-TJV.21	Java Technology	Z,ZK	5
I ne goal is to provi	ide knowledge and skills for developing information systems and applications through concepts used in software development and exp from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.	erience with librarie	es and tools
BI-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		
	ires provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies and explain relevant physical principles. In the labs, the respective technologies are physical principles.	-	
-	ortant ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethern	-	
	always with focus on high-speed networks.		
BI-TS1	Theoretical Seminar I	Z	4
	wig intended for attudents which want to some in deeper context with contemporary the excited computer ecience. It is mostly a cleared	· · · ·	ha atudanta
	ar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic		
are treated individu	ally and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a v other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		

BI-TS2	Theoretical Seminar II	Z	4
	ar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic ally and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a		
	other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		paporo ana
BI-TS3	Theoretical Seminar III	Z	4
	r is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic		
are treated individu	ally and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	work with scientific	papers and
BI-TS4	Theoretical Seminar IV	7	4
	I record to community which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic	al reading group. T	
are treated individu	ally and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a	work with scientific	papers and
	other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	771	-
BI-TUR.21 Students gain a b	User Interface Design asic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where softwa	Z,ZK	5 ucts 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.		
BI-TWA.21	Design of Web Applications	Z,ZK	5
	e of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some propertie and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications,		-
. ,	acilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony		
	on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework React		
BI-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	ainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer si oduced 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 com	•	-
	(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.		
BI-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 and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace reg		cyberspace
BI-ULI	Introduction to Linux	Z	2
	familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become f	amiliar with basic of	commands
	and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (te		
BI-UOS.21	Unix-like Operating Systems g systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative fu	KZ	5 r operating
	uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic propert		
	eads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of		
	e 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	
BI-VAK.21 The course aims to	Selected Applications of Combinatorics pintroduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the bit	Z asic courses we a	3 oproach the
	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, optimiz: also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.	ation and more. Stu	udents will
BI-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		
	ch as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data cer	-	
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.			
BI-VES.21	Embedded Systems	Z,ZK	5
	esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedd	I ' I	
	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
BI-VHS	Virtual game worlds tudents to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current stud	ZK ZK	4 furthermore
	the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. T	-	
	the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR device		,
BI-VIZ.21	Data Visualization	KZ	5
	an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understandin eas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocess	-	
	ata such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of s		-
	examples in the Python programming language.		
BI-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 w		
	he linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interestin		
BI-VPS.21	Selected Topics in Computer Networking	Z,ZK	5
	upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technolo	-	
networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real network devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and security.			
BI-VR1	Virtual reality I	KZ	4
	al Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of	I I	
The course focus	es on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves con	nputational thinking	, empathy
	and shared social activities.		

BI-VR2 Continuation of the	Virtual reality II e course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The object	KZ ctive is to develop a	3 applications
	for computer science and gamification in various social metaverse and desktop engines.	·	
BI-VWM.21	Searching the Web and Multimedia Databases	Z,ZK	5
Students get bas	ic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage	of documents. In	particular,
students acquire	information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from v	veb pages. They g	et detailed
knowledge of simil	arity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web sea	arch engines for the	e mentioned
	data types (documents).		
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
•	led system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the		
	robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control		
interfaces, robot n	avigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get p technologies.	ractical experience	e with these
BI-ZNF	PHP Framework Nette - basics	KZ	3
	the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech po	1	-
Students will gain	knowledge should serve for the efficient creation of a web backend in PHP language.		ne resulting
BI-ZPI	Process engineering	KZ	4
	fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of pr	1	
	used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of busin	-	-
	ole of process engineering for information systems development is discussed as well as its importance in the overall context of informa		
	an enterprise.		
BI-ZRS.21	Basics of System Control	Z,ZK	5
The course gives	an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus	our attention part	icularly on
control of engine	ering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description	methods of system	m models,
basic linear dynam	ic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creati	ng a description of	the system
	linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given		
control loops, issu	ies of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial i	mplementation of	continuous
	and digital controllers and PLC control.		
BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or res		
•	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio		
-	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	-	
employment with a	exceeds the academic year's dead-line.		e internariip
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re-	- 1	-
	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio		
-	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
employment with a	a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	o two subjects if the	e internship
	exceeds the academic year's dead-line.		
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
Each student car	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or res	search institution.	Before the
-	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio		
•	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
employment with a	a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	o two subjects if the	e internship
DI 70D 04	exceeds the academic year's dead-line.	7 71/	
BI-ZSB.21	Basics of System Security	Z,ZK	5
	ourse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensi analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder		
Such as maiware	analysis of incident response. After infisining the course student will get both theoretical and practical knowledge in the area of model as well as skills needed for independent work in the area of operating system security incident analysis.	i operating system	is security,
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	troduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed	,	
	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also b		
	virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art du		
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
	This course is presented in Czech.	_,	-
BIE-CSI	Introduction to Computer Science	Z	2
	tory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie	lds but interested	
science, high-sch	ool 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	o introduce
and relate basic p	principles of computer science for students to understand, early on, what computer science is, why things such as high-level programn	ning languages an	d tools are
	y are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not		
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 sc	cience more
	than expected, or even less than before.		
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		
-	theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered wit		
polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications. Finally, an introduction to			
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.			
BIE-EEC	English language external certificate	Z	4
	se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English	1	
,	the B2 level of the Common European Framework of Reference for Languages.	,	J

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	ble to apply them	in particular
examples.			
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 c	perating systems	for students
	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking t		
understand the	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor	currency is, as op	posed to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.	7 71/	4
BIE-ZUM	Artificial Intelligence Fundamentals uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classica	Z,ZK	4
	i-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm		
	be presented as well.		
FI-TOP	Academic writing	Z	2
	portant and required part of research activity. It is not only about obtaining research results but also about applying them in the form of	I I	
publications can be	e useful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the court	rse, students will le	earn how to
write a scientific art	icle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an	article and reviewir	ng someone
else's article. The	course will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Da	ites will be determi	ined based
	on the availability of enrolled students.		-
FIT-ITI	Modern IT infrastructure	Z,ZK	5
FIT-SEP	World Economy and Business	Z,ZK	4
	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by co		
	vorld economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of di		
	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		in marriadar
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	ices a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco	· · · ·	
of the key periods	in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	history. From large	economic
area of Roman Em	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution	ons is deciphered.	The course
does not cover de	tailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	rganizations in his	tory. Class
	meetings will consist of a mixture of lecture and discussion.		_
NI-AFP	Applied Functional Programming	KZ	5
	ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional pu and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master		-
the fise flowadays	necessary competence of a software engineer: the theory and especially the practice.	ing this paradigin t	Jecomes a
NI-DDM	Distributed Data Mining	KZ	4
	state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of	I I	large scale
data processing fra	amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a	nd will be capable	to propose
	approaches to parallelize other algorithms. The course is prezented in czech language.		
NI-DSP	Database Systems in Practes	Z,ZK	4
	This course is presented in Czech.	7 714	4
NI-DZO	Digital Image Processing nts a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg	Z,ZK	4
	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als		
	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR		
	abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conv		-
interactive as-rig	gid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac	lding depth, alpha	matting.
NI-IAM	Internet and Multimedia	Z,ZK	4
	e is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq	-	
	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical u		
audiovisual transmissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effect of various components on the quality and latency of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the scene up to the presentation			
	for audience.	s scelle up to the p	lesentation
NI-LSM	Statistical Modelling Lab	KZ	5
	ented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p	I I	
-	on and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis	s).	
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
	gramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where i	-	
is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills of design and implementation			
of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development needs and areas of interest. In addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work on interesting projects and OO			
-	ms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem		
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
	mantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	· · ·	
Introduction to category theory.			
NI-OLI	Linux Drivers	Z,ZK	4
	system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po	-	
	ability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developmer		lents. The
CO	urse provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica	al experience.	

NI-PDD	Data Preprocessing	Z,ZK	5
Students learn to p	repare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s	ources, such as im	ages, texts,
time series, etc., a	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris	tics from images or	from web
	pages.		
NI-PSD	Public Services Design	KZ	4
	oduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p		•
suppliers (devs a	ind designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	n with client represe	entatives.
	Course is aimed at students-designers as well as clients.	r	
NI-PSL	Programming in Scala	Z,ZK	4
	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature		-
advance standard l	ibrary. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and	l libraries e.g. Play, (Cassandra,
	Scalaz, etc.		
NI-REV	Reverse Engineering	Z,ZK	5
	equainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before		
	will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated and how they interact with 3rd party libraries.		
	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de		
debuggers and de	ebugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer	malware scene. Th	ie focus of
	the course is on the seminars, where students will solve practically oriented tasks from the real world.		_
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds	upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	rious variants and a	applications
	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
NI-TSP	Testing and Reliability	Z,ZK	5
-	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre		
the intuitive path se	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu	ilt-in-self-test equip	ment. They
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
-	n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	-	
	rtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie		
	rameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect		-
management of col	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in and development tools (Continuous integration and development).	the use of modern	integration
		7 71/	4
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.	_	
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVK1	Physical Education	Z	1
TVKLV		—	•
	Physical Education Course	Z	0
TVKEV			
	Physical Education Course	Z	0

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-07-03, time 21:33.