#### Study plan

### Name of study plan: Study plan for Ukrainian refugees

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Unspecified Specialisation of Study Garantor of the study branch: doc. RNDr. Ing. Marcel Ji ina, Ph.D. Program of study: Welcome page Type of study: unknown Required credits: 15 Elective courses credits: 0 Sum of credits in the plan: 15 Note on the plan:

Name of the block: Compulsory courses in the program Minimal number of credits of the block: 15 The role of the block: P

Code of the group: BIE-PP-UKR

Name of the group: Compulsory bachelor courses for Ukrainian refugees Requirement credits in the group: In this group you have to gain at least 15 credits (at most 23) Requirement courses in the group: In this group you have to complete 3 courses Credits in the group: 15 Note on the group:

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.) Czech Language 7 for Ukrainian refugees UKCJ7 7K Z.L 10 10C Р Zden k Muziká UKMAT Z,ZK 5 3P+2C Р **Mathematics UK Preparatory Mathematics for Ukrainian refugees** 7 **UKR-PKM** 5 Z,L Р Tomáš Kalvoda

# Characteristics of the courses of this group of Study Plan: Code=BIE-PP-UKR Name=Compulsory bachelor courses for Ukrainian refugees

UKCJ7	Czech Language 7 for Ukrainian refugees	ZK	10		
Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.					
UKMAT	Mathematics UK	Z,ZK	5		
UKR-PKM	Preparatory Mathematics for Ukrainian refugees	Z	5		
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.					

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	Completion	Credits	Scope	Semester	Role
	<i>members)</i> Tutors, <i>authors</i> and guarantors (gar.)	Completion	oround	00000		noio
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 <b>Jan Starý</b> 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
NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	КZ	5	2P+1C	L	V
BI-BLE	<b>Blender</b> Lukáš Ba inka <b>Lukáš Ba inka</b> Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes Tomáš Vichta Tomáš Vichta (Gar.)	Z,ZK	4	2P+1C	L	V
NI-PSD	Public Services Design Ond ej Brém, David Pešek David Pešek Ond ej Brém (Gar.)	KZ	4	1P+2C		V
BIE-DIF	Differential equations Ond ej Bouchala, Antonella Marchesiello, Jan Valdman 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	Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er 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-EJK	Enterprise Java and Kotlin Jií Dan ek <b>Jií Dan ek</b> Jií Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek <b>Tomáš ejka</b> Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Ji í Cvr ek, Vojt ch Miškovský, Robert Hülle, Jan ezní ek Robert Hülle Robert Hülle (Gar.)	КZ	4	3C	L	V
NI-IAM	Internet and Multimedia	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch 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	<b>C# language and data access</b> Pavel Št pán <b>Pavel Št pán</b> 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.)	κz	4	3C	Z	V
BI-SQL.1	Language SQL, advanced Michal Valenta Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	V
BI-QAP	Quantum algorithms and programming Ivo Petr, Tomáš Kalvoda Ivo Petr Ivo Petr (Gar.)	КZ	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 (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPL	<b>Managerial Psychology</b> Jan Fiala <b>Jan Fiala</b> 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 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 Petr Pauš, Ji í Chludil Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová <b>Zde ka echová</b> Zde ka echová (Gar.)	KZ	4	3C	Z,L	V

BI-ORL	<b>Operations Research and Linear Programming</b> Dušan Knop <b>Dušan Knop</b> 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 (Gar.)	KZ	5	4C	L	V
BI-ACM2	Programming Practices 2 Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	Z	V
BI-ACM3	Programming Practices 3 Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
BI-ACM4	Programming Practices 4 Tomáš Valla, Ond ej Suchý 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.)	KZ	4	3C	L,Z	V
BI-PJV	<b>Programming in Java</b> Jan Blizni enko, Miroslav Balík, Ji í Borský, Jan Zimolka <b>Miroslav Balík</b> Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-KOT	<b>Programing in Kotlin</b> Jií Dan ek <b>Jií Dan ek</b> Jií Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	<b>Programming in Scala</b> Jií Dan ek <b>Jií Dan ek</b> 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-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 (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II Hana Kubátová 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 Žárek Lukáš Ba inka Jan Žárek (Gar.)	Z,ZK	4	2+2	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 <b>Tomáš Evan</b> Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVK1	Physical Education Luboš Neuman Ji ( Drnek (Gar.)	Z	1		L,Z	V
TVV	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
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, Tomáš Valla, Ond ej Suchý <b>Tomáš Valla</b> Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Dušan Knop, Tomáš Valla, Ond ej Suchý <b>Tomáš Valla</b> Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Tomáš Valla, Ond ej Suchý <b>Tomáš Valla</b> Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Tomáš Valla, Ond ej Suchý <b>Tomáš Valla</b> Tomáš Valla (Gar.)	Z	4	2C	L	V

NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	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 (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Alena Libánská, Jakub Šenovský, Tomáš Houdek Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Jan Ž árek, Petr Zemánek, Zden k Muziká <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z	2	4D	Z	V
NI-VCC	Virtualization and Cloud Computing Jan Fesl, Tomáš Vondra Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán <b>Petr Klán</b> 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-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	<b>3D Printing</b> Miroslav Hron ok, Tomáš Sýkora <b>Tomáš Sýkora</b> 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

BI-ADW.1	Windows Administration	Z,ZK	4		
This course is presente	d 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	d deepens the study of topics touched upon in the basic course in logic.				
BI-AVI.21	Algorithms visually	Z,ZK	4		
The course complement	ts other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute	r science that exte	end substantially		
knowledge presented in	BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.or	g <http: td="" www.al<=""><td>govision.org&gt;)</td></http:>	govision.org>)		
that make understandin	g the principles of algorithms easy.				
BI-A2L	English language, preparation for the B2 level exam	Z	2		
The content of the cour	se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme	nt - students are	due to: -Take an		
active part in the langua	age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both	the midterm and	the final term		
tests with the success r	ate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	s during the first		
class of the term.					
NI-AFP	Applied Functional Programming	KZ	5		
This course is presente	d in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function	al programming la	inguages are on		
the rise nowadays and	the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas	tering this paradic	jm becomes a		
necessary competence	of a software engineer: the theory and especially the practice.				
BI-BLE	Blender	Z,ZK	4		
The course extends know	wledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those	interested in 3D	graphics and		
animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course.					
NI-DSP	Database Systems in Practes	Z,ZK	4		
This course is presented in Czech.					

NI-PSD	Public Services Design	KZ	4		
The course will introdu	ce students to specifics of UX, Service design and development for public sector. We will look into the design and development	nt process from th	e perspective of		
suppliers (devs and de	signesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborati	on with client repr	esentatives.		
Course is aimed at students-designers as well as clients.					
BIE-DIF	UTTERENTIAL EQUATIONS	Z,ZK	5 In like constration		
of variables. Key theore	ens on existence and uniqueness establish when solutions can be quaranteed. Linear and system-based ODEs are covered	with methods like	characteristic		
polynomial analysis, fo	lowed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicati	ons. Finally, an inf	roduction to		
partial differential equa	tions (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD	Es and PDEs, inc	uding implicit		
and explicit Euler meth	ods, 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	algorithms that ar	e both easy to		
implement and have ar	interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that i	s also valuable ou	tside the domain		
of digital image proces	sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF	R compression, de	e-blurring in		
frequency domain, abs	traction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray c	conversion, contex	t enhancement,		
interactive as-rigid-as-	bossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a	dding depth, alpha	a matting.		
NI-DDM	Distributed Data Mining	KZ	4 with large cools		
data processing frame	e-or-me-an approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand york Anache Shark and with evicting distributed DM / ML algorithms. They will learn principles of their parallel implementation	us on experience	with large scale		
approaches to parallel	ze other algorithms. The course is prezented in czech language.	is and will be capa	able to propose		
BI-EP1 2/	Effective programming 1	K7	1		
The course is taught in			7		
BI-FP2	Efficient Programming 2	K7	4		
Continuation of Efficier	t Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving ind	ividual problems a	are discussed.		
with the aim to choose	the best one and avoid implementation errors.		,		
BI-ANGK	English language, contact preparation for the B2 level exam	7	2		
The content of the cou	se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme	ent - students are	due to: -Take an		
active part in the langu	age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both	the midterm and	the final term		
tests with the success	rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by	individual teacher	s during the first		
class of the term.					
BI-EJK	Enterprise Java and Kotlin	Z,ZK	4		
The course is on adva	iced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise infor	mation systems w	ith microservice		
architecture, that can b	e deployed to the cloud.				
BI-HAM	HW accelerated network traffic monitoring	KZ	4		
This course introduces	students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring.	The monitoring an	d analysis of		
network traffic are mar	datory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as	a source of inform	nation and data		
for analysis). The goals	of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network t	raffic on a hardwa	are and software		
level and to develop the	eir practical abilities in this field.		_		
BI-HMI	History of Mathematics and Informatics	Z,ZK	3		
This course is presente	a in Czech.	1/7			
BI-ARD	Interactive applications on Arduino	KZ	4		
I he subject is designed	for students of first grade of bachelor study as introduction to embedded systems. Students will learn now to design simple application with believe of available libraries. The each of the subject is to obtain a students will be appended by the subject is to obtain the subject is to be appended by the subject is tobs appended by the subject is to be appended by	ications for moder	n programmable		
not only on display of a	PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefor	a is suitable even	for Web and		
Software Engineering			IOI WED allu		
	Internet and Multimedia	7 7K	1		
The NI-IAM course is f	ITTELLET ATTU MULTITEUIA	Caulisition of AV si	+ (input)		
presentation of AV sign	als (output) network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic	al use case scen	arios of real-time		
audiovisual transmissio	ons. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the	effect of various c	omponents 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	g the scene up to	the presentation		
for audience.					
BIE-CSI	Introduction to Computer Science	Z	2		
This is an introductory	class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in othe	er fields but intere	sted in computer		
science, high-school st	udents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	goal of the class	is to introduce		
and relate basic princip	les of computer science for students to understand, early on, what computer science is, why things such as high-level progra	mming languages	and tools are		
done the way they are,	and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer	not just basic con	nputer science		
questions but also que	stions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inter-	erested in comput	er science more		
than expected, or even	less than before.				
FITE-EHD	Introduction to European Economic History	Z,ZK	3		
The course introduces	a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global e	conomy through	the description		
of the key periods in hi	story. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econom	hic history. From la	irge economic		
area of Roman Empire	to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial inst	d organizations in	biotory Close		
meetings will consist o	a economic history of particular European countries but rather the impact of trade and fole of particular events, institutions and	u organizations in	TIISIOLY. CIASS		
	Introduction to Mathematica 2	7	2		
Students refresh and c	I minuture of elementary functions and their properties. Students understand basic mathematical principles and they a	re able to apply th	∠ em in particular		
examples	and anomouse of oronomary randmono and their properties. Ordrento understand basic mathematical principles and their d		ion in particular		
BLCS2	C# language and data access	k7	Λ		
	Ο# ια ι yuayt al lu uala αυστοο tata access course objective is to introduce students several data access technologies - database. YML NoSOL on the Mig	I NZ	4 ne students will		
get to know objects us	ad to retrieve data - Connection, Command, Data Reader and DataAdanter v ADO NFT Next, they will learn to use current te	chnologies such a	is LINO - a set		
of features for querving	and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects XMI and SOI	_ (LINQ to Objects	s, LINQ to XML		
and LINQ to SQL). And	ther objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data	a using domain-sp	ecific objects		
(ORM). This part of the	course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mo	del, Storage Mod	el and Mapping		
		-			

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 ove on this platform. They will learn to create WebAPI and to use it by client programs.	rview of the developm	ent possibilities
BI-SQL.1 Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL languag	e. In particular stored	program unites,
triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the	point of view of speci	alized database
structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution p will be discussed Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on	an and possibilities o	f its. changes
PostgreSQL.		
BI-QAP Quantum algorithms and programming	KZ	5
Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mecha	nics, on which quantu	Im technologies
are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software de on Python language. Knowledge of linear algebra at the level of RI-I A1 and RI-I A2 (or RI-I IN) is necessary. Previous completion of RI-MA2 or RI	<ul> <li>Velopment kit Qiskit, v</li> <li>VMM and experience</li> </ul>	which is based
might be an advantage. No previous knowledge of physics is assumed.		s warr yalon
NI-LSM Statistical Modelling Lab	KZ	5
The subject is oriented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress	s is put on the effective	e use of the
available information and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithr 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).	hs, and analyses of th	ieir properties.
BI-HAS Human Aspects in Cryptography and Security	Z.ZK	5
This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for deve	lopers. Students of th	is course can
use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
NI-MPL Managerial Psychology		2
NI-MSI   Mathematical Structures in Computer Science Mathematical semantics of programming languages. Data types as continuous lattices. Scott topology, Procedures as continuous mappings. The S	∠,∠K   scott model of lambda	4 calculus
Introduction to category theory.		calculus.
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 U	niversal serial bus (U	SB). The course
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of devices are practically oriented.	of USB devices, Linux	and Windows
BLMIT Mikrotik technologies	K7	3
The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which a	re commonly used by	the small and
middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on	the metallic, optical c	r wireless links
and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary comp	uter networks concep	ts like protocols
and technologies of the data-link, network and transport layer of the OSI model.	K7	Λ
Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems.	rv∠   where its ability to nat	4 ural abstraction
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	e 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 developm	ent 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 technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct in	work on interesting p	rojects and OO
RI-MVT 21 Modern Visualisation Technologies		5
The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and	augmented reality, vi	sualization on
high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the m	entioned technologies	, namely fractal
and procedural visualization, scientific data visualization, and 3D model scanning.		
BI-MMP   Multimedia team project	KZ	4
PLOP	K7	5
The subject aims to introduce students to the issues of operational research and primarily to the practical application of linear programming as a	fundamental optimize	tion technique.
Operational research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such a	s management).	·
NI-OLI Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combin	ning powerful process	ors and FPGAs
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver develop course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experiences of the second statement of various types drivers.	oment for master's stu nce.	idents. The
BI-ACM Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	1 1	-
BI-ACM2 Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
BI-ACM3   Programming Practices 3	KZ	5
RI-ΔCM4 Programming Practices 4		5
This is a selective course for preparing talented student for representation in international programming contests.	K7	5
BI-AND.21 Programming for the Android Operating System	KZ	5
	KZ KZ	5
This course is presented in Czech.	кz кz	5
This course is presented in Czech. BI-CS1 Programming in C#	КZ КZ КZ	5
This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundame paraters arrays loops definitions and calls of functions will be discussed. Attention is focused as the object oriented experiments in C#.	KZ KZ KZ ntal construction, type	5 4 4 es of variables,
This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundame operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debu	KZ KZ KZ ntal construction, type definition and class i gging and exception	5 4 es of variables, instancing, processino. as
This course is presented in Czech. BI-CS1 Programming in C# The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundame operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuwell as work with files are emphasized.	KZ KZ KZ ntal construction, type definition and class i gging and exception	5 4 4 es of variables, nstancing, processing, as
This course is presented in Czech.         BI-CS1       Programming in C#         The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundame operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuwell as work with files are emphasized.         BI-PJV       Programming in Java	KZ KZ Ntal construction, type definition and class i igging and exception Z,ZK	5 4 es of variables, nstancing, processing, as 4

BI-KOT	Programing in Kotlin	Z.ZK	4
Kotlin is a modern, stat	ically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of ad	vanced language	constructions.
The language is fully Ja	ava compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of	f a modern, object	t-functional way
with minimum of boiler-	plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).		
NI-PSL	Programming in Scala	Z,ZK	4
The course introduces	, the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language fea	tures - e.g.pattern	matching and
advance standard librar	y. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks	and libraries e.g.	Play, Cassandra,
Scalaz, etc.			
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be workin	g with modern technical and scientific software. Students will learn how to use different programming styles (functional progra	amming, rule-base	ed programming,
etc.), how to create dyn	amic interactive applications and visualisations, data processing and presentations.		
BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a genera	l overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ad	dition, they gain a	deeper insight
into shell and some oth	er particular scripting languages and will get practical experience with shell script programming.		
NI-PDD	Data Preprocessing	Z,ZK	5
Students learn to prepa	re raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da	ata sources, such	as images, texts,
time series, etc., and le	arn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characte	eristics from image	es or from web
pages.			
BI-PKM	Introduction to mathematics	Z	4
This course is presente	d in Czech.	1	I
NI-REV	Reverse Engineering	Z.ZK	5
Students will get acqua	inted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens	before and after t	the main function
is called. Students will u	inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is de	dicated to reverse	engineering of
applications written in C	C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be o	dedicated to debug	ggers: how
debuggers and debugg	ing work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compu	ter malware scene	e. The focus of
the course is on the ser	minars, where students will solve practically oriented tasks from the real world.		
BI-SCE1	Computer Engineering Seminar	Z	4
The Seminar of Compu	the Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistant	ce to failures and a	attacks. Students
are approached individ	ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of	the subject is wor	k with scientific
articles and other profe	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	chers. The topics	are new for each
semester.			
BI-SCE2	Computer Engineering Seminar II	7	4
The Seminar of Compu	the Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistant	ce to failures and a	attacks. Students
are approached individ	ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of	the subject is wor	k with scientific
articles and other profe	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	chers. The topics	are new for each
semester.			
BI-ST1	Network Technology 1	7	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 acredit	ed under the Cisc	o Netacad -
CCNA1 - R&S Intr	oduction to Networks.		
BI-ST2	Network Technology 2	7	3
This course is presente	din Czech.	-	l C
BI-ST3	Network Technology 3	7	3
Students will further en	processor in cost included acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented duri	ng BI-ST1 and BI-	ST2 courses will
get further extended in	the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pre	dictability, extensi	ion bevond a
simple topology, securit	v. etc.	,	
BI-ST/	Network Technology 4	7	3
Students will further en	Interwork recommonly +	ing presented dur	ing BI-ST1 and
BI-ST2 courses got furt	hard the monorage and the protocol of the protocol of the protocol stations to dain certain advantance like increased of	ficiency predictab	ility extension
beyond a simple topolo	or security etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a complete	ly other type of ne	etwork (Non
Broadcast Multiple Acc	ess) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and swi	tch firmware. perfe	orm password
recoveries, and emerge	ncv procedures. Also the security aspect is treated: students will learn possible intra- and inter-network attacks and the mitic	ation wavs while	maintaining the
network running.			<b>J</b>
BI-SK   21	Scripting Languages	7 7K	4
Students gain a general	I overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ad	ا <i>د. د. د.</i> اdition, they dain a	a deeper insight
into shell and some oth	er particular scripting languages and will get practical experience with shell script programming.	,, gante	
FIT-SEP	World Economy and Business	7 7K	4
This course is presente	, worra Economy and Dubinous d in Czech. The course introduces students of technical university to the international business. It does that predominantly business.	ا مرتب روند روند المرتبع المرتب المرتبع المرتبع	idual countries
and key regions of work	e economy. Students get to know about different religions and cultures necessary for doing husiness in diverse societies as	Il as indexes of ec	onomic freedom
corruption and econom	is development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	of discussions bas	sed on individual
readings. It is advised t	o take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SEP	World Economy and Business	7 7K	1
This course is presente	which become in the business to technical university to the international business. It does that predominantly business		idual countries
and key regions of work	d economy. Students get to know about different religions and cultures increasary for doing business in diverse societies as we	I as indexes of ec	onomic freedom
corruption and econom	ic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form	of discussions bas	sed on individual
readings. It is advised t	o take bachelor level of this course BIE-SEP as a prerequisite.		
NI-SYP	Parsing and Compilers	7 7K	5
The module builds upon	the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge	ا مرجع روب المرجع ا I مرجع المرجع ا	and applications
of LR parsing and are in	ntroduced to special applications of parsers, such as incremental and parallel parsing.		
BIE-SEG	Systems Engineering	7	0
This is an introductory	joyotomo Engineering for hachelor students in computer science. The goal of the class is to introduce basic principles	of operating syst	ems for students
to understand processo	and on exploring on page on a second structure in a compare science. The goal of the class is to introduce basic principles of the class. After take	ing the class stur	ents are able to
understand the differen	ce between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what or	ncurrency is as r	opposed to
parallelism, and how pr	ocesses and threads synchronize efficiently to overcome concurrency for communication		

TVK1	Physical Education	Z	1			
TVV	Physical education	Z	0			
TV1	Physical Education	Z	0			
TVV0	Physical education	7	0			
TV2	Physical Education	7	0			
	Physical Education	7	0			
	Physical Education Course	<u> </u>	0			
IVKZV	Physical Education Course	Z	0			
BI-TS1	Theoretical Seminar I	Z	4			
Theoretical seminar is ir	tended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a clas	ssical reading gro	up. The students			
are treated individually a	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is	s a work with scie	ntific papers and			
other scholarly literature	a. The capacity is limited by the the potentials of the teachers of the seminar.	-				
BI-TS2	Theoretical Seminar II		4			
I heoretical seminar is in	tended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	ssical reading gro	up. The students			
are treated individually a	and concern themselves with interesting topics from the latest research in the area. I herefore, an integral part of the course is	s a work with scie	ntific papers and			
	z. The capacity is infinited by the the potentials of the teachers of the seminal.	7	4			
BI-153		۷.	4			
I neoretical seminar is in	itended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	ssical reading gro	up. The students			
ate treated individually a	and concern memselves with interesting optics from the latest research in the area. Therefore, an integral part of the course is	s a work with scie	nunc papers and			
	a the capacity is limited by the the potentials of the teachers of the seminital.	7	4			
BI-154 The section is in the section of the	Ineoretical Seminar IV	۷.	4			
I neoretical seminar is in	itended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	ssical reading gro	up. The students			
ate treated individually a	and concern memselves with interesting optics from the latest research in the area. Therefore, an integral part of the course is	s a work with scie	nunc papers and			
	a the capacity is limited by the me potentials of the teachers of the seminital.	7 71/	5			
NI-TSP	lesting and Reliability	Z,ZK	5			
Students will gain know	edge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to practice and the security of the security o	prepare a test set	with the help of			
the intuitive path sensiti	zation and to use an AIPG for automatic test generation. They will be able to design easily testable circuits and systems with	Duilt-In-Self-test	equipment. They			
will be able to compute,	analyze, and control the reliability and availability of the designed circuits.	1/7	4			
BI-QUA	Quality Assurance	KZ	4			
I his course introduces	students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context	t of different types	or software			
development and will ex	perience nands-on application testing using both manual and automated testing. At the end of the semester, the student sho	uid be prepared i	o perform a test			
	test scenarios, prepare lest data, automate an appropriate portion of the scenarios, and prepare a report on the bugs round					
	Academic writing	Z	2			
Publishing is an importa	int and required part of research activity. It is not only about obtaining research results but also about applying them in the following the strugger of a bashelarie or most of these is the strugger of a bashelarie or most of these is the strugger of th	rm of publication.	will leave how to			
publications can be use	ful to students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the c	course, students v	iowing compose			
olso's article. The course	what parts such an an use should have, and now the peer review process works. Students will also ity their hand at presenting a will be taught in block, with an allower at the bacinoing of the consistence and one practicum in the middle of the constant.	Datas will be date	arminod based			
on the availability of enr	e will be laught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester.	Dates will be det	ennineu baseu			
	Compiler Construction	7 71	F			
DI-CCIN This is an introductory of	Complier Construction	∠,∠N	C students to			
understand the design a	hass on complet construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of the class	Sludenis lo			
	Tay and Tunoaraby		4			
DI-IEA	IEA ANU TYPOGIAPHY His Crach This course gives basics of programming in TeX (plain TeX, ConTeXt LaTeX, OnTeX, LucTeX). To second part of t	Z,ZN	4 s on typographic			
			s on typographic			
	Introduction to European Economia History	7 71/	2			
	in Iroduction to European Economic Fistory	Z,ZR	3			
	an ozeni. However, nere is an English variation the program monnauts (Broot / 4755).	71/	2			
BI-KSA	Cultural and Social Anthropology	ZK	2			
The one-semester cours	se 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			
shown The course is pr	n nom our exolic cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, ne	ealth, history, dea	in, etc) will be			
		7	2			
BI-ULI Studente honome femili	Introduction to Linux	ے در formiliar with how	Z			
Students become familia	ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become	e familiar with ba	sic commands			
and techniques of a Uni	x-inke system, topics can be suched inst mederationally and then practically vernied in a virtual machine (terminal).	7 71/	-			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5			
Students will gain know	ledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	d organizations. I	hey will get			
acquainted with virtualiz	ation principles, tools and technologies that serve to racilitate and automate configuration, testing and monitoring, and to eth	iciently operate ar	na optimize the			
performance parameter	s or modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	live technology to	day for the			
and development tools (	Continuous interaction and development)		deminegration			
	Vintuel register and development).	1/7	4			
DI-VKI	Virtual reality I on the Albert of the sector and virtual section. Another chiesting is to meet the subsection of the sector of	NZ	4			
The course focuses on	early (VK), vindar reality operating system and vindar reality creation. Another objective is to meet the fuels and requirements the ways of tooching using virtual reality too adjust and virtual reality creation. Another objective is to meet the fuels and requirements the ways of tooching using virtual reality too adjusts and the fuels are set.	s of virtual worlds	communication.			
and shared social activit			ang, empany			
	Nixtual reality II	1/7	2			
DI-VRZ	VII tual reality II so Virtual Reality I The new course focuses on collaborative teleprocence, spatial computing and social life of avatars. The a	hiactive is to dow	Jon applications			
for computer science and camification in various social metaverse and decision engines						
	Solocted Applications of Combinatorica	7	<b>o</b>			
The course aims to intro	ociocical Applications of contrations branches of theoretical computer science and combinatories. In contrast to the		J			
issue from applications	www superior in an accessible form to various branches of medical computer science and combinatorics. In contrast to the	e basic courses, ' asic data structure	approach the			
with the active participa	tion of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) i	informatics Areas	from which we			
will select problems to h	e solved will include, for example, graph theory, combinatorial and algorithmic game theory approximation algorithms, optim	ization and more	Students will			
also try to implement so	Jutions to the studied problems with a special focus on the effective use of existing tools	and more.				

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 Leb	esgue integral. We then address Fouri	er series and their
properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation	on (FFT). We discuss the wavelet trans	form. We examine
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.	·	
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 research institution	ution. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provid	e evidence of the professional content	and extent of the
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in I	S KOS. Every 10 credits correspond to	4 weeks of full-time
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. Th	is amount can be divided into two subj	ects 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 research institution	ution. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provid	e evidence of the professional content	and extent of the
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in I	S KOS. Every 10 credits correspond to	4 weeks of full-time
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. Th	is amount can be divided into two subj	ects 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 institution	ution. Before the
internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provid	e evidence of the professional content	and extent of the
internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in I	S KOS. Every 10 credits correspond to	4 weeks of full-time
employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. Th	is amount can be divided into two subj	ects if the internship
exceeds the academic year's dead-line.		
BI-ZIVS Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artific	cial 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 f	undamentals of motion control, sensor	reading, application
interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulato	r and real hardware to get practical ex	perience with these
technologies.		
BI-ZPI Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for underst	anding formal principles of process mo	delling and they will
learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formali	sation and modelling of business proc	esses using modern
CASE tools. The role of process engineering for information systems development is discussed as well as its importance in	the overall context of information and I	ousiness strategy of
an enterprise.		
BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.		
BI-ZWU Introduction to Web and User Interfaces	Z.ZK	4
This course is presented in Czech.	, _,	·
BI-3DT.1 3D Printing	KZ	4

# Code of the group: BIE-V.2021

# Name of the group: Purely Elective Bachelor Courses, Version 2021 till 2024/25 Requirement credits in the group:

## Requirement courses in the group:

### Credits in the group: 0

#### Note on the group:

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Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-ZRS	Basics of Systems Control	Z,ZK	4	2P+2C	L	V
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BIE-SCE1	Computer Engineering Seminar I Miroslav Skrbek, Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
BIE-SCE2	Computer Engineering Seminar II Hana Kubátová, Ji í Vysko il Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	Czech Language for Foreigners Tomáš Houdek, Markéta Hofmannová, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	v
BIE-CZ1.21	Czech Language for Foreigners II Tomáš Houdek, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	КZ	2	4C	Z,L	v
UKCJP	Czech language for advanced Jakub Šenovský, Tomáš Houdek, Jakub Šolc, Adam Vostárek Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	2	2BP+2BC	Z,L	v
BIE-DIF	Differential equations Ond ej Bouchala, Antonella Marchesiello, Jan Valdman Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-EPR	Economic project Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	V

BIE-FTR.1	Financial Markets	Z,ZK	5	2P+2C	L	V
BIE-HAS	Human Factors in Cryptography and Security Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BIE-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BIE-PKM	Preparatory Mathematics Jitka Rybní ková Tomáš Kalvoda (Gar.)	Z	4		Z	V
BIE-PJV	Programming in Java Jan Blizni enko <b>Jan Blizni enko</b> Jan Blizni enko (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
BIE-PRR.21	Project management David Pešek David Pešek (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BIE-SKJ.21	<b>Scripting Languages</b> Lukáš Ba inka, Jan Ž árek <b>Lukáš Ba inka</b> Jan Ž árek (Gar.)	Z,ZK	4	2P+2C	L	V
BIE-VAK.21	Selected Combinatorics Applications Dušan Knop, Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BIE-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVV	Physical education	Z	0	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
BIE-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-VR1.21	Virtual reality I Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BIE-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
FITE-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	Z	V
BIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V

# Characteristics of the courses of this group of Study Plan: Code=BIE-V.2021 Name=Purely Elective Bachelor Courses, Version 2021 till 2024/25

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 essen	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 applica	tions. Finally, an inf	troduction to
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OI	DEs and PDEs, inc	luding implicit
and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-CSI Introduction to Computer Science	Z	2
This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in oth	ner fields but intere	sted in computer
science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	e goal of the class	is to introduce
and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level progr	amming languages	s and tools are
done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer	r not just basic cor	nputer science
questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are in	terested in comput	er science more
than expected, or even less than before.		
FITE-EHD Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global	economy through	the description
of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econo	mic history. From la	arge economic
area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial in	stitutions is deciphe	ered. The course
does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and	nd organizations in	history. Class
meetings will consist of a mixture of lecture and discussion.		
BIE-IMA2 Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they	are able to apply th	nem in particular
examples.		
BI-SCE1 Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistant	ice to failures and a	attacks. Students
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part o	the subject is wor	k with scientific
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar ter	achers. The topics	are new for each
semester.		

BIE-SEG			
This is an introductory of	Systems Engineering	Z	0
	ass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	of operating syste	ems for students
to understand processo	and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking a between processes and threads as well as amulation and virtualization, what virtual memory is and how it works, what ear	ng the class, stud	ents are able to
parallelism and how pro	cesses and threads synchronize efficiently to overcome concurrency for communication	icultericy is, as o	pposed to
	Physical education	7	0
	Physical education	7	0
	Physical Education	<u> </u>	0
	Physical Education Course	771	0
DIE-ZKS	Basics of Systems Control of System Control is designed for anyone interacted in applied computer science in bachelor studies. A brief introduction to t	Z,ZN	4
be definitely evaluated b	v our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will foc	cus our attention r	articularly on
control of engineering a	In the second	each you descript	tion methods of
system models, basic lir	ear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey cour-	se in which stude	nts will learn the
methods of creating a de	scription of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PS	SD and fuzzy cont	rollers. Attention
is also given to sensors	and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller param	neters and certair	n aspects of the
industrial implementatio	of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examined	ples and practica	al industrial
implementations.			
BIE-CCN	Compiler Construction	Z,ZK	5
This is an introductory of	ass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	s of compilers for	students to
	The implementation of programming languages. Seeing and actually understanding self-compliation is the overarching meme		4
BIE-SUE1	Computer Engineering Seminar I	L L L	4 sttocko Studento
are approached individu	I Engineering is a (spelective course to students who want to deal with deeper topics of digital design, reliability and resistand	he subject is worl	k with scientific
articles and other profes	sional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teac	hers. The topics a	are new for each
semester.			
BIE-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Comput	Find the second se	e to failures and a	attacks. Students
are approached individu	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	he subject is worl	k with scientific
articles and other profes	sional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teac	hers. The topics a	are new for each
semester.			
BIE-CZ0	Czech Language for Foreigners	KZ	2
Course Czech for foreig	ers offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.		
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2
hasic vocabulary and cl	or Students of English programmes who have completed BIE-C20 course of have basic knowledge of the Czech language. I	ne course turtne	r expands the
	Czech language for advanced	<b>7 7</b> K	2
An advanced Czech cou	rse for Likrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with validity for CTU	Ζ,ΖΙΥ	2
RIF-FPR		7	1
This course is an extens	ion of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher v	will contact you be	efore the start of
the semester.		,,	
BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector has been	n deeply transformed in the recent years, which led to a development of structured financial products, a new point of view or	the issue of crea	dit risk, and
globalization of market a	ctivities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activ	vities, many firms	need graduates
from technical schools v	ho have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of f		
		inancial markets.	The Financial
Markets course thus en	lobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical	inancial markets. I tools used in thi	The Financial s field.
Markets course thus en BIE-HAS	Human Factors in Cryptography and Security	inancial markets. I tools used in this Z,ZK	The Financial s field. 5
Markets course thus en BIE-HAS This course is for studer	Human Factors in Cryptography and Security to interested not only in technical scope of computer science, but also in making products usable - for users and for developed to the science of the security and science of the security of the s	inancial markets. I tools used in this Z,ZK ers. Students of th	The Financial s field. 5 nis course can
Markets course thus end BIE-HAS This course is for studed use their gained knowle	Human Factors in Cryptography and Security ts interested not only in technical scope of computer science, but also in making products usable - for users and for developed tge to design, plan and analyse their own projects in the context of human-centered security.	inancial markets. I tools used in this Z,ZK ers. Students of th	The Financial s field. 5 his course can
Markets course thus en BIE-HAS This course is for studer use their gained knowle BIE-EHD	Human Factors in Cryptography and Security ts interested not only in technical scope of computer science, but also in making products usable - for users and for developed tge to design, plan and analyse their own projects in the context of human-centered security. Introduction to European Economic History	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK	The Financial s field. 5 his course can 3
Markets course thus end BIE-HAS This course is for studer use their gained knowle BIE-EHD The course introduces a of the key periods in his	Jobes both a description of financial markets and related economic theories, and an overview of mathematical and statistica         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developed to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eropean economic history.	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK conomy through the bistory. Errom lab	The Financial s field. 5 his course can 3 the description
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Markets course thus end BIE-HAS This course is for studed use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire to does not cover detailed	Jobes both a description of financial markets and related economic theories, and an overview of mathematical and statistica         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developed to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global erory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic pragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial insti aconomic history of particular European countries but rather the impact of trade and role of particular events, institutions and	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK conomy through the ic history. From lating itutions is deciphed organizations in	The Financial s field. 5 his course can 3 the description irge economic rred. The course history. Class
Markets course thus end BIE-HAS This course is for studen use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire to does not cover detailed meetings will consist of	Jobes both a description of financial markets and related economic theories, and an overview of mathematical and statistica         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developed to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global erory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic pragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial insti economic history of particular European countries but rather the impact of trade and role of particular events, institutions and a mixture of lecture and discussion.	inancial markets. I tools used in this Z,ZK ers. Students of th Z,ZK conomy through ic history. From la itutions is deciphe d organizations in	The Financial s field. 5 his course can 3 the description arge economic ared. The course history. Class
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Markets course thus end BIE-HAS This course is for studen use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire to does not cover detailed meetings will consist of BIE-ST1 The course is focused of Introduction to Networks	Biobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developinge to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global e ory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic pragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institucions and a mixture of lecture and discussion.         Network Technology 1       nessentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad current	inancial markets. I tools used in this Z,ZK ers. Students of th Z,ZK conomy through ic history. From la itutions is deciphe d organizations in Z rriculum, CCNA1	The Financial s field. 5 his course can 3 the description ared course history. Class 3 - R&S
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Markets course thus end BIE-HAS This course is for studen use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire to does not cover detailed meetings will consist of BIE-ST1 The course is focused of Introduction to Networks BIE-PKM The purpose of Prepara	Biobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developinge to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global erory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial instigeconomic history of particular European countries but rather the impact of trade and role of particular events, institutions and a mixture of lecture and discussion.         Network Technology 1       n         n essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad curt.         Preparatory Mathematics       ory Mathematics is to help students revise the most important topics of high-school mathematics.	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK conomy through the ic history. From la itutions is deciphed d organizations in Z rriculum, CCNA1	The Financial s field. 5 his course can 3 the description urge economic ared. The course history. Class 3 - R&S 4
Markets course thus end BIE-HAS This course is for studed use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire f does not cover detailed meetings will consist of BIE-ST1 The course is focused of Introduction to Networks BIE-PKM The purpose of Prepara BIE-PJV	Biobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developing to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global erory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic pragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions and a mixture of lecture and discussion.         Network Technology 1       n         n essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad current Mathematics is to help students revise the most important topics of high-school mathematics.         Programming in Java	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK conomy through the ic history. From la itutions is deciphed d organizations in Z rriculum, CCNA1 Z Z,ZK	The Financial s field. 5 his course can 3 the description urge economic ared. The course history. Class 3 - R&S 4 4
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Markets course thus end BIE-HAS This course is for studen use their gained knowle BIE-EHD The course introduces a of the key periods in his area of Roman Empire 1 does not cover detailed meetings will consist of BIE-ST1 The course is focused of Introduction to Networks BIE-PKM The purpose of Prepara BIE-PJV The course Programmir will also be presented, e	Jobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical         Human Factors in Cryptography and Security         Its interested not only in technical scope of computer science, but also in making products usable - for users and for developinge to design, plan and analyse their own projects in the context of human-centered security.         Introduction to European Economic History         selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eveloping or fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institucions and a mixture of lecture and discussion.         Network Technology 1       n         n essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad current affairs is to help students revise the most important topics of high-school mathematics.         Programming in Java       g         g in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java specially data structures, files, GUI, networking, databases and concurrent APIs.	inancial markets. I tools used in this Z,ZK ers. Students of the Z,ZK conomy through the ic history. From la itutions is deciphe d organizations in Z rriculum, CCNA1 Z Z,ZK a language the fu	The Financial s field. 5 his course can 3 the description urge economic ared. The course history. Class 3 - R&S 4 4 ndamental APIs
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BIE-PRR 21 Project management	7 7K	5
The aim of the course is to introduce students into the basic concents and principles of project management i.e. methods of planning, teamwork a	alvsis crisis man	agement in a
molect communication and meeting management Students will practice project management techniques (a SWOT analysis, is	assessment and	management
project, communication, argumentation and meeting management araphs) and creation of project documentation. The course is designed especially for	students who are	interested in
denening their knowledge outside IT consider string their own company or have ambitions to work in middle or senior management positions in	large companies	The course is
deepening their knowledge outside in, consider stating their own company, or have ambitions to work in middle or senior management positions in also suitable for all those who will develop software or bardware in the form of team projects.	large companies.	
also suitable to all troose with with develop software of hardware in the form of learn projects.	7 71/	4
BIE-SKJ.21   Scripting Languages	,∠κ	4
Join us on a tour into the world of scripted programming. logether, we will unveil the power of Bourne Again shell and PERL as proven industry star	dards, as well as a	a couple of other
standard text processing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. V	/e will provide a ge	eneral overview
of scripting languages and introduction into their pros and cons and students get practical experience with shell script programming. We will touch a	Iso ROFF, PerIDo	c, and even TeX
to get some insight into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you a	advanced program	ming techniques
and tricks that get overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the so	cripting world. Luka	aš is a renowned
lecturer in advanced shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whether the several CE countries are shall be a several center of the seve	iose code contribu	tes to safe and
streamline operations of cloud service datacenters around the globe.		
BIE-VAK.21 Selected Combinatorics Applications	Z	3
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the	ne 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 b	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, optin	nization and more.	Students will
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		
BIF-VMM Selected Mathematical Methods	7 7K	4
The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesque integral. We then	address Fourier s	eries and their
properties. Further we introduce and study the properties of the Discrete Fourier Transform (DET) and its fast implementation (FET) We discuss the	e wavelet transform	n We examine
the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples		
BIE TI D 21 Ilogr Interface Decise	7.74	5
BIG-TOR.21 OSET Interlated Design	$\angle, \angle r$	U oducto do not
Students gant a basic over view of methods for designing and testing common user interfaces. They get experience to solve the problems where so		oducis do noi
communicate with the user optimality, since the needs and characteristics of users are not taken into account during product development. Students	gain an overview	or methods that
bing users into the development process to ensure optimal interface for them.		
BIE-VR1.21 Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The	e course focuses o	on the ways of
creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities.		
BIE-ADW.1 Windows Administration	Z,ZK	4
Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use th	e standard admini	stration and
security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adr	ninistrate
heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.		
FITE-SEP World Economy and Business	Z.ZK	4
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries an	d kev regions of w	orld economy.
Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo	m. corruption and	economic
development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on i	ndividual readings	. It is advised to
take bachelor level of this course BIE-SEP as a prerequisite.	<b>J</b>	
BIE-SEP World Economy and Business	7 7K	Δ
The outries introduces students of technical university to the international business. It does that predominantly by comparing individual countries on	d key regions of the	
The output and bound should different reliaions and cultures pagescary for displaying singles. It does that predominating by comparing Hulvidual could less that predominating by comparing Hulvidual could could less that predominating by comparing Hulvidual could could less that predominating by comparing Hulvidual could could less that predominating by comparing the predominating by comparing by comparing the predominating by comparing the predominating by comparing by	m corruption and	economic
development, which are needed for the right investment decision. Seminare help to improve on the knowledge in the form of discussions based on it	ndividual roadingo	It is advised to
accomposition, which are needed to use fight investment decision, certained interview on the knowledge in the form of discussions based on it	numuuai reaulinys	
ומה שמטופוטו ופיפו טו ווווג טעווגב שוב-שבר מג מ אופופעעוגונג.		

Code of the group: NIE-V.21 Name of the group: Purely elective master's courses 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
NIE-BLO	Blockchain Josef Gattermayer, Marek Bielik, Jakub R ži ka, Róbert Lórencz <b>Josef</b> Gattermayer Róbert Lórencz (Gar.)	Z,ZK	5	1P+2C	z	V
NIE-CPX	Complexity Theory Dušan Knop, Ond ej Suchý Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	3P+1C	Z	V
NIE-VYC	<b>Computability</b> Jan Starý <b>Jan Starý</b> Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
NIE-MVI	Computational Intelligence Methods Pavel Kordík, Miroslav epek <b>Pavel Kordík</b> Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-ARI	Computer arithmetic Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	4	2P+1C	Z,L	V
NIE-SCE1	Computer Engineering Seminar Master I Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
NIE-SCE2	Computer Engineering Seminar Master II Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V

NI-DSW	Design Sprint Ond ej Brém, Michal Manda Michal Manda David Pešek (Gar.)	Z	2	30B	Z	V
NI-DID	Digital drawing Denisa Nová ková, Eliška Novotná Denisa Nová ková Denisa Nová ková (Gar.)	Z	2	4C	Z,L	v
NIE-EVY	Efficient Text Pattern Matching Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-GLR	Games and reinforcement learning	Z,ZK	4	2P+2C	L	V
NI-GRI	Grid Computing	Z,ZK	5	2P+1C	Z	V
NIE-HMI	History of Mathematics and Informatics	Z,ZK	3	2P+1C	Z	V
NIE-DVG	Introduction to Discrete and Computational Geometry Maria Saumell Mendiola Maria Saumell Mendiola Maria Saumell Mendiola (Gar.)	Z,ZK	5	2P+1C	L	v
FITE-EHD	Introduction to European Economic History	Z,ZK	3	2P+1C	L	V
NIE-AM2	Middleware Architectures 2 Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-PAM	Parameterized Algorithms Ond ej Suchý Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	4	2P+1C	L	V
NIE-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-ROZ	Pattern Recognition Michal Haindl Michal Haindl (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-PML	Personalized Machine Learning Rodrigo Augusto Da Silva Alves Karel Klouda Rodrigo Augusto Da Silva Alves (Gar.)	Z,ZK	5	2P+1C	Z	v
NI-AML	Advanced machine learning Zden k Buk, Miroslav epek, Rodrigo Augusto Da Silva Alves, Petr Šimánek, Vojt ch Rybá Miroslav epek Miroslav epek (Gar.)	Z,ZK	5	2P + 1C	L	v
NIE-PDL	Practical Deep Learning Martin Barus, Yauhen Babakhin Karel Klouda Karel Klouda (Gar.)	KZ	5	2P+1C	Z	V
NIE-VPR	Research Project Št pán Starosta Št pán Starosta Št pán Starosta (Gar.)	Z	5		Z,L	V
NIE-SWE	Semantic Web and Knowledge Graphs Milan Doj inovski Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-HSC	Side-Channel Analysis in Hardware Voit ch Miškovský, Petr Socha Voit ch Miškovský Voit ch Miškovský (Gar.)	Z,ZK	4	2P+2C	Z	v
NIE-DDW	Web Data Mining Milan Doi inovski Milan Doi inovski Milan Doi inovski (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-BPS	Wireless Computer Networks Alexandru Moucha Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	4	2P+1C	L	v
FITE-SEP	World Economy and Business	Z,ZK	4	2P+2C	Z	v
NIE-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+1C	Z	V
Characteristics of the	courses of this group of Study Plan: Code=NIF-V.21 Name=Pu	rely elective	master	's courses	\$	
	roduction to European Economic History	lely elective	master	<u>3 courses</u> 7	3 7 K	3
The course introduces a sel of the key periods in history. area of Roman Empire to fra does not cover detailed econ meetings will consist of a mi	ection of themes from the European economic history. It gives the student basic knowle As European countries have been dominant actors in this process it focuses predomin agmentation of the Middle Ages, from destruction of WWII to the current affairs, the devi- nomic history of particular European countries but rather the impact of trade and role of xture of lecture and discussion.	edge about formin antly on their role elopment of mod	ng of the gle es in the ec lern financia s, institutior	obal economy conomic histo al institutions ns and organi	y through the ry. From large is deciphered zations in his	description e economic d. The course story. Class
FITE-SEP We The course introduces stude	orld Economy and Business ents of technical university to the international business. It does that predominantly by c	omparing individ	ual countrie	Zes and key re	,ZK gions of world	4 d economy.
Students get to know about development, which are nee	arrerent religions and cultures, necessary for doing business in diverse societies as we ded for the right investment decision. Seminars help to improve on the knowledge in the	ell as indexes of e e form of discuss	economic fr sions basec	eedom, corru I on individua	ption and eco I readings. It i	onomic is advised to
NIF-BLO	ourse BIE-SEP as a prerequisite.			7	7K	5
Students will understand the code and deploy a secure de	foundations of blockchain technology, smart contract programming, and gain an overvie ecentralized application, and assess whether integration of a blockchain is suitable for a	ew of most notable a given problem.	le blockcha The course	in platforms.	Fhey will be a creased emp	ble to design, hasis on the
relationship between blockcl supervising implementation	hains and information security. It is concluded with a defense of a research or applied s of blockchain-based solutions in both academia and business.	emester project,	which prep	ares the stuc	lents for imple	ementing or
NIE-CPX Co	omplexity Theory			Z	"ZK	5
Students will learn about the	e fundamental classes of problems in the complexity theory and different models of algo plems.	pritms and about	implication	s of the theor	y concerning	practical
NIE-VYC Co	omputability			7	ZK	4
Classical theory of recursive	functions and effective computability.				, =	
NIE-MVI Co	omputational Intelligence Methods	tional artificial in	tolligonos		"ZK	5

solving a wide range	of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Stuc	lents will learn how	v these metho	ods
ork and how to apply	them to problems related to data extraction, management, intelligence in games and optimisation, etc.			
	Computer arithmetic	7 7K	1	

		Jaraner III Hatt	uic uii
to solving a wide range	f problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Stu	idents will lea	rn hov
work and how to apply t	nem to problems related to data extraction, management, intelligence in games and optimisation, etc.		
NIE-ARI	Computer arithmetic	Z,ZK	(
Students will learn vario	us data representations used in digital devices and will be able to design arithmetic operations implementation units.		

NIE-SCE1 Computer Engineering Seminar Master I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resis	tance to failures and	attacks. Students
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Par	t of the subject is wor	k with scientific
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar	teachers. The topics	are new for each
NIE CCE2	7	4
INIE-SUEZ COMPUTER Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resis	tance to failures and	4 attacks Students
are approached individually within the subject. Each students or group of students solves some interesting topics of digital design, reliability and resis	t of the subject is wor	k with scientific
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar	teachers. The topics	are new for each
semester.		
NI-DSW Design Sprint	Z	2
Students will work on projects using the Design Sprint method, developed by Google. THanks to this method the teams are able to go from idea to	o validated prototype	in 5 days. During
the course the students will get familiar with the method as participants. Through practical challenges they will try the whole 5 day process starting	ng with research and	finishing with
testing the prototypes (plus final presentation).		
NI-DID Digital drawing	Z	2
The course will introduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of compositio	n, perspective and co	lor theory, which
they will practically apply in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The	course is fit for anyor	e who wants to
practice or learn drawing and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practical	3 gained knowledge.	
NIE-EVY   Efficient lext Pattern Matching	Z,ZK	5
They will be able to use the knowledge in design of applications that utilize pattern matching	raccess time and me	mory complexity.
NLCL R Games and reinforcement learning.	7.7%	1
The field of reinforcement learning is very hot recently because of advances in deep learning, recurrent neural networks and general artificial in	elligence This cours	e is intended to
give you both theoretical and practical background so you can participate in related research activities. Presented in English.	elligence. The courts	
NI-GRI Grid Computing	Z.7K	5
Grid computing and gain knowledge about the world-wide network and computing infrastructure.		l C
NIE-HMI History of Mathematics and Informatics	Z.ZK	3
The course focuses on selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today compu-	iter science The topic	s are selected
for finding some relations between computer science and mathematical methods. Some examples of applications of mathematics to computer science and mathematical methods.	ciences will be showe	ed.
NIE-DVG Introduction to Discrete and Computational Geometry	Z,ZK	5
The course intends to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get family	liar with the most fund	amental notions
of this discipline, and to be able to solve simple algorithmic problems with a geometric component.		
NIE-AM2 Middleware Architectures 2	Z,ZK	5
Students will learn new trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application arch	itectures, concepts a	ind technologies
for microservices, distrubuted cache and databases, smart contracts, realtime communication and web security.		1
NIE-PAM Parameterized Algorithms	Z,ZK	4
There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often r	ecessary to solve the	ese problems
exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Of	en one can find a col	mmon property
and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomially in the input size (which can be huge).	mial time preprocess	sing of the input
which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent s	olution method. We v	/ill present a
plethora of parameterized algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorith	m (presumably) doe	s not exist. We
will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes.		
NIE-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	ge of various variants	and applications
of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
NIE-ROZ Pattern Recognition	Z,ZK	5
The aim of the module is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of t	he statistical approac	h to pattern
recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation	1, and their numerica	aspects.
NIE-PML Personalized Machine Learning	Z,ZK	5
Personalized machine learning (PML) is a sub-field of machine learning that aims to create models and predictions based on the unique characteristics.	eristics and behavior	s of individual
entities. While PML is commonly used in applications such as recommender systems, which recommend items to users based on their personal	interests, its principle	s can be applied
to a wide range of other neids, including education, medicine, and chemical engineering. In this course, we will explore the fatest PML methods from perspectives. Specifically, we will focus on cutting-edge models that are of interest to both the research and commercial communities.	i meoretical, algorithi	nic, and practical
NI AMI	7.74	Б
The course introduces students to selected advanced topics of machine learning and artificial intelligence. The topics present techniques in the field	ے کر جرب ا Id of recommendation	svstems image
processing, control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with	the methods discuss	ed.
NIE-PDI Practical Deep Learning	K7	5
This course is designed to provide students with a comprehensive understanding of Deep Learning using PvTorch, a popular open-source mach	ine learning framewo	rk. Throughout
the course, students will develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in field	s such as computer v	ision and natural
language processing.		
NIE-VPR Research Project	Z	5
1. At the beginning of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on pa	rtial tasks that should	be carried out
during the semester. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at	the end of the semes	ster. 2. External
Master these (MT) supervisor fills his/her assessment into the paper "Form to award assessment by an external Final theses (FT) supervisor" (fi	or the courses BIE-B/	AP, MIE-MPR,
MIE-DIP). Students, then, ensure that the assessment is registered into the information system (IS) by asking their internal FT opponent to awar	d the assessment to	the IS based on
the confirmation of the external MT supervisor. In the case the FT opponent is external as well, the assessment will be registered to the IS by the	encode of the department for the upper state	nent responsible
aim at fine-tuning the ET topic so that the ETT will be complete and approvable at the end of the somestor.	it for the upcoming se	emester should
NIE SWE Somentie Web and Knewledge Craphe	7 71/	F
The students will learn the most recent concents and technologies of the Semantic Web. The course will provide an evention of the Semantic Web. The course will provide an evention of the Semantic Web.	∣ ∠,∠ħ eh technologios, mot	C J
practices for modelling, integration, publishing, querving and consumption of semantic data. The students will also gain skills in creation of know	edge graphs and the	ir systematic
quality assurance.	3- 3- 3- 3- 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-,

NIE-HSC Sid	e-Channel Analysis in Hardware			7	' 7K	4
This course is dedicated to s	p-called side-channel information leakage in hardware devices. It focuses on both the	oretical analysis a	and practical	attacks. St	udents get fan	niliar with
various kinds of side channel	s and they get deeper insight in power attacks. Students learn to implement various p	rofiled and non-p	rofiled attacl	ks and get fa	amiliar with hi	gher-order
attacks. They also get practic	e in both designing the SCA countermeasures and analyzing the amount and charact	eristics of the side	e-channel in	formation le	eakage.	
NIE-DDW We	b Data Mining			Z	Z,ZK	5
Students will learn latest met	hods and technologies for web data acquisition, analysis and utilization of the discove Neb structure analysis. Web usage analysis. Web content mining and information extract	red knowledge. S	tudents will	gain an ove	rview of Web	mining
in the field of social web and	recommendation systems.		also gain an		mostrecente	evelopmenta
NIE-BPS Wir	eless Computer Networks			Z	Z,ZK	4
Students will learn about the	modern technologies, protocols, and standards for wireless networks. They will under	stand the routing	mechanism	s in ad-hoc	networks, mu	ticast and
broadcast mechanisms, and	data flow control mechanisms. They will also learn about principles of communication	in sensor networ	ks. They get	knowledge	of security me	echanisms
for wireless networks and ge	skills of configuration of wireless network elements and simulation of wireless netwo	rks using suitable	tools.			
The course introduces stude	TIG ECONOMY AND BUSINESS	comparing individ	ual countries	Z	$\Delta, \Delta \mathbf{R}$	4 Leconomy
Students get to know about of	lifferent religions and cultures, necessary for doing business in diverse societies as we	ell as indexes of e	conomic fre	edom, corru	uption and eco	nomic
development, which are need	led for the right investment decision. Seminars help to improve on the knowledge in the	e form of discuss	ions based	on individua	al readings. It i	s advised to
take bachelor level of this cou	urse BIE-SEP as a prerequisite.					
Code of the group	o: NI-V.2021					
Name of the grou	p: Purely Elective Master Courses					
Requirement cred	lits in the group:					
Requirement cou	rses in the group.					
Credite in the grad						
Note on the group	up. U	a an alaatiy		uroo tha	t in offere	d within
Note on the group	): In addition to the courses listed here, you can enfort a				ic is oliere	
	program/branch/specialization or a compulsory electi		ourses o	of this ar	bun that a	student
	has completed in the bachelor study at CTU cannot h	e re-comple	ted	n uns gro	Sup that a	Student
	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their	Completion	Crodite	Scone	Somostor	Pole
Code	members)	completion	Credits	Scope	Semester	Role
	Iutors, authors and guarantors (gar.)					
NI-AOA	Zden k Muziká	Z	1			V
NI-ATH	AlgorithmicTheories of Games Dušan Knop, Tomáš Valla Tomáš Valla (Gar.)	Z,ZK	4	2P+2C	L	V
	Applied Functional Programming	1/7	F	20.40		
NI-AFP	Robert Pergl, Marek Suchánek, Daniel N mec <b>Robert Pergl</b> Robert Pergl (Gar)	rZ	5	2P+1C	L	V
	Architecture of computer games	7 7K	1	2P+1C	7	V
	Adam Vesecký Adam Vesecký Adam Vesecký (Gar.)	2,213		21 110	<u> </u>	v
NI-VGA	Video Games Architecture Jan Matoušek	Z,ZK	5	2P+1C	Z	V
NI-BPS	Ji í Kašpar, Alexandru Moucha Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	4	2P+1C	L	V
	Blockchain	7 74	5	1P+20	7	V
INIE-DLO	Josef Gattermayer, Marek Bielik, Jakub R ži ka, Robert Lorencz <b>Josef</b> Gattermayer Róbert Lórencz (Gar.)	Ζ,ΖΝ	5	16+20	2	V
	Capture The Flag				_	
NI-CTF	Ivana Trummová, Ji í Dostál, Martin Šutovský, Ladislav Marko, František Ková	KZ	4	3C	Ζ	V
	Game Design	7 71/	E	20,10	1	N
	Adam Vesecký	Ζ,ΖΙ	5	26410	L	v
NI-DSW	Design Sprint Ond ei Brém. Michal Manda <b>Michal Manda</b> David Pešek (Gar.)	Z	2	30B	Z	V
NI-PSD	Public Services Design	K7	4	1P+2C		V
	Ond ej Brém, David Pešek <b>David Pešek</b> Ond ej Brém (Gar.)					•
NI-DID	Digital drawing Denisa Nová ková, Eliška Novotná <b>Denisa Nová ková</b> Denisa Nová ková	Z	2	4C	Z,L	v
	(Gar.)					
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
NI-PAM	Efficient Preprocessing and Parameterized Algorithms Ond ej Suchý <b>Ond ej Suchý</b> Ond ej Suchý (Gar.)	Z,ZK	4	2P+1C	L	V
NI-ESC	Experimental Project Course Ond ej Brém, Jan Matoušek Ond ej Brém Ond ej Brém (Gar.)	KZ	8	0P+30R+52C	L	V
NI-GLR	Games and reinforcement learning	Z,ZK	4	2P+2C	L	V
NI-GNN	Graph Neural Networks	Z,ZK	4	1P+1C	L	v
	Miroslav epek Miroslav epek Miroslav epek (Gar.) Grid Computing			-		
NI-GRI	André Sopczak, Petr Fiedler André Sopczak (Gar.)	Z,ZK	5	2P+1C	Z	V

NI-HCM	Mind Hacking Marcel Ji ina, Josef Holý Marcel Ji ina Marcel Ji ina (Gar.)	ZK	5	2P+1C	Z	V
NI-HSC	Side-Channel Analysis in Hardware Vojt ch Miškovský, Petr Socha Petr Socha Vojt ch Miškovský (Gar.)	Z,ZK	4	2P+2C	Z	V
NI-HMI2	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	ZK	3	2P+1C	Z	V
NI-IBE	Information Security	ZK	2	2P	Z	V
NI-IVS	Intelligent embedded systems Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	L	V
NI-IKM	Internet and Classification Methods Martin Hole a Martin Hole a Martin Hole a (Gar.)	Z,ZK	4	1P+1C	L	V
NI-IAM	Internet and Multimedia	Z,ZK	4	2P+1C	L	V
NI-IOT	Internet of Things	Z,ZK	4	2P+1C	L	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
NI-KTH	<b>Combinatorial Theories of Games</b> Tomáš Valla <b>Tomáš Valla</b> Tomáš Valla (Gar.)	Z,ZK	4	2P+1C	L	V
NI-FMT	Finite model theory Tomáš Jakl Tomáš Jakl (Gar.)	Z,ZK	4	2P+1C	L	V
NI-CCC	Creative Coding and Computational Art Radek Richtr, Josef Kortán Radek Richtr Radek Richtr (Gar.)	KZ	4	1P+2C	Z,L	V
NI-KYB	Cybernality	ZK	5	2P	Z	V
NI-LSM2	Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.)	ΚZ	5	3C	Z,L	V
NI-LOM	Linear Optimization and Methods Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPL	<b>Managerial Psychology</b> Jan Fiala <b>Jan Fiala</b> 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
NI-MZI	Mathematics for data science Št pán Starosta	Z,ZK	4	2P+1C	L	V
FIT-ITI	Modern IT infrastructure	Z,ZK	5	2P+1C	Z,L	V
NI-MOP	Modern Object-Oriented Programming in Pharo Jan Blizni enko Robert Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	V
NI-NLM	Neural Language Models	Z	5	2P+1C	L	V
NI-NMS	Neural Networks, Machine Learning and Randomness Martin Hole a	Z,ZK	4	1P+1C	Z	V
NI-NMU	New media in art and design Zden k Svejkovský Zden k Svejkovský Zden k Svejkovský (Gar.)	ZK	3	2P+0C	Z	V
NI-OLI	Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V
NIE-PML	Personalized Machine Learning Rodrigo Augusto Da Silva Alves Karel Klouda Rodrigo Augusto Da Silva Alves (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-ARI	Computer arithmetic Pavel Kubalík <b>Pavel Kubalík</b> Alois Pluhá ek (Gar.)	Z,ZK	4	2P+1C	Z,L	V
NI-PG1	Computer Grafics 1 Radek Richtr Radek Richtr (Gar.)	ZK	4	2P+1C	L	V
NI-PIV	Computer Vision Radek Richtr	Z,ZK	5	2P+2C	Z	V
NI-EDW	Enterprise Data Warehouse Systems Jakub Krej í, Robert Kotlá <b>Jakub Krej í</b> Magda Friedjungová (Gar.)	Z,ZK	5	1P+1C	L	V
NI-PVR	Advanced Virtual Reality Petr Pauš Petr Pauš Petr Pauš (Gar.)	ΚZ	4	2P+1C	Z	V
NI-AML	Advanced machine learning Zden k Buk, Miroslav epek, Rodrigo Augusto Da Silva Alves, Petr Šimánek, Vojt ch Rybá <b>Miroslav epek</b> Miroslav epek (Gar.)	Z,ZK	5	2P + 1C	L	V
NI-IOS	Advanced techniques in iOS applications Rostislav Babá ek, Igor Rosocha, Jakub Olejník Martin P Ipitel Martin P Ipitel (Gar.)	ΚZ	4	2P+2C	L	V
NI-APT	Advanced Program Testing Pierre Donat-Bouillud Pierre Donat-Bouillud (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-PVS	Advanced embedded systems Miroslav Skrbek	Z,ZK	4	2P+2C	Z	V
NI-DNP	Advanced .NET Nikolas Jíša, David Šenký David Šenký Nikolas Jíša (Gar.)	Z,ZK	4	2P+1C	Z	V
NI-PYT	Advanced Python Miroslav Hron ok	KZ	4	3C	Z	V
NIE-PDL	Practical Deep Learning Martin Barus, Yauhen Babakhin Karel Klouda Karel Klouda (Gar.)	KZ	5	2P+1C	Z	V
NI-GOL	Programming of distributed systems in GO	KZ	5	0P+3C	Z	V

NI-PSL	Programming in Scala	Z,ZK	4	2P+1C	Z	V
NI-RUB	Programming in Ruby	KZ	4	3C	Z	V
NI-ROZ	Pattern Recognition Michal Haindl, Radek Richtr Michal Haindl Michal Haindl (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-PLS1	Programming Language Seminar Pierre Donat-Bouillud	Z	2	0P+1C	Z	V
NI-PLS3	Programming Language Seminar Pierre Donat-Bouillud	Z	2	0P+1C	Z	V
NI-PLS2	Programming Language Seminar Pierre Donat-Bouillud	Z	2	0P+1C	L	V
NI-PLS4	Programming Language Seminar Pierre Donat-Bouillud, Filip K ikava Pierre Donat-Bouillud Pierre Donat-Bouillud (Gar.)	Z	2	0P+1C	L	V
NI-SCE1	Computer Engineering Seminar Master I Hana Kubátová Miroslav Skrbek Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
NI-SCE2	Computer Engineering Seminar Master II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
NI-SZ1	Knowledge Engineering Seminar Master I Pavel Kordík Magda Friedjungová (Gar.)	Z	4	2C	L,Z	V
NI-SZ2	Knowledge Engineering Seminar Master II Pavel Kordík Magda Friedjungová (Gar.)	Z	4	2C	L,Z	V
PI-SCN	Seminars on Digital Design Petr Fišer Petr Fišer Petr Fišer (Gar.)	ZK	4	2P+1C	Z,L	V
NI-MLP	Machine Learning in Practice Jan Hu in Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+1C	Z	V
FIT-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	L	V
NI-SEP	World Economy and Business Tomáš Evan <b>Tomáš Evan</b> Tomáš Evan (Gar.)	Z,ZK	4	2P+1C	Z,L	V
NI-TVR	Virtual Reality Technology Tomáš Nová ek Tomáš Nová ek Tomáš Nová ek (Gar.)	Z,ZK	3	1P+1C	L,Z	V
NI-TS1	Theoretical Seminar Master I Dušan Knop, Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
NI-TS2	Theoretical Seminar Master II Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
NI-TS3	Theoretical Seminar Master III Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
NI-TS4	Theoretical Seminar Master IV Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
NI-TKA	Category Theory Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
NI-TNN	Theory of Neural Networks Martin Hole a Martin Hole a (Gar.)	Z,ZK	5	2P+1C	L	V
NI-CPX	Complexity Theory Dušan Knop, Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	3P+1C	Z	V
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
NI-DVG	Introduction to Discrete and Computational Geometry Maria Saumell Mendiola Maria Saumell Mendiola Maria Saumell Mendiola (Gar.)	Z,ZK	5	2P+1C	L	V
NI-VOL	Elections Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+1C	L	V
NI-VYC	Computability Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VPR	Research Project Št pán Starosta Št pán Starosta Št pán Starosta (Gar.)	Z	5		Z,L	V
NI-ZS10	Master internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
NI-ZS20	Master internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
NI-ZS30	Master internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V

#### Characteristics of the courses of this group of Study Plan: Code=NI-V.2021 Name=Purely Elective Master Courses

 NI-AFP
 Applied Functional Programming
 KZ
 5

 This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming languages are on the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mastering this paradigm becomes a necessary competence of a software engineer: the theory and especially the practice.
 NI-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 process from the perspective of suppliers (devs and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration with client representatives.

Course is aimed at students-designers as well as clients.

	7 71/	4
NI-DZO Digital image Processing	<b>Ζ,Ζ</b> Κ	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals w	with practical algorithms that	are both easy to
implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical back	ground that is also valuable	outside the domain
of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone m	happing, HDR compression,	de-blurring in
frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, co	olor-to-gray conversion, con	text enhancement,
interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization	n, painting, adding depth, al	oha matting.
NI-DDM Distributed Data Mining	KZ	4
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students	will gain hands on experiend	e with large scale
data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel im	plementations and will be c	apable to propose
approaches to parallelize other algorithms. The course is prezented in czech language.	<u>.</u>	
NLIAM Internet and Multimedia	7.7K	1
The NLIAM course is focused on prioriciles and modern technologies for network transmissions of audiovisual (AV) signals. The sullabu	2,21	eignale (input)
The Minimized set of the set of t	ask at practical use asso as	signals (input),
presentation of AV signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will in audiovidual transmissions (Within the che, attudants will practically accomple AV transmissions and stereoscopy. We will be	ook at practical use case so	
autovisual utarismissionis, within the tabs, students will practically assemble Av transmission chains using my and Sw technologies at	the assession the energy of variou	
the quality and latency of AV transmissions. Students will learn now to build internet infrastructure for end-to-end AV transmissions from	the recording the scene up	to the presentation
FITE-EHD Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming o	of the global economy throug	h the description
of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in	n the economic history. From	large economic
area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern	financial institutions is deci	ohered. The course
does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, in	stitutions and organizations	in history. Class
meetings will consist of a mixture of lecture and discussion.		
NI-MPI Managerial Psychology	ZK	2
NI MSL Mathematical Structures in Computer Science	7.71	
Nither Statistical Structures in Computer Science		<del>4</del>
Mathematical semantics of programming languages. Data types as continuous lattices, Scott topology. Procedures as continuous mapping	igs. The Scott model of lam	oda calculus.
Introduction to category theory.	1	n in the second s
NI-MOP Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information	systems, where its ability to	natural abstraction
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 a	ind 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 are	eas of interest. In
addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opport	ortunity to work on interestin	g projects and OO
technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate ou	r direct involvement in the P	haro Consortium.
	7.7%	1
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip a		
The Linux operating system is an important operating system or personal computer and also for embedded systems. Systems on citipa a	and combining powerful proc	
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux drivers		Sludenis. The
acurac provides knowledge of Linux operating avotem architecture, principles of development of various types drivers, including practice		
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica	al experience.	
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica           NI-PSL         Programming in Scala	al experience.	4
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical         NI-PSL       Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la	al experience.	4 ern matching and
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica         NI-PSL       Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful	al experience. Z,ZK anguage features - e.g.patte I frameworks and libraries e.	4 ern matching and g. Play, Cassandra,
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica         NI-PSL       Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful Scalaz, etc.	al experience. Z,ZK anguage features - e.g.patte I frameworks and libraries e.	4 rn matching and g. Play, Cassandra,
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practica         NI-PSL       Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful Scalaz, etc.         FIT-SEP       World Economy and Business	al experience. Z,ZK anguage features - e.g.patte I frameworks and libraries e. Z,ZK	4 ern matching and g. Play, Cassandra, 4
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical NI-PSL         NI-PSL       Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful Scalaz, etc.         FIT-SEP       World Economy and Business         This course is presented in Czech. The course introduces students of technical university to the international business. It does that predictions for the international business.	al experience. Z,ZK anguage features - e.g.patte I frameworks and libraries e. Z,ZK dominantly by comparing inc	4 ern matching and g. Play, Cassandra, 4 ividual countries
course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical NI-PSL         Programming in Scala         The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance la advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful Scalaz, etc.         FIT-SEP       World Economy and Business         This course is presented in Czech. The course introduces students of technical university to the international business. It does that pred and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse some students of technical university.	al experience. Z,ZK anguage features - e.g.patte I frameworks and libraries e. Z,ZK dominantly by comparing inc cieties as well as indexes of	4 ern matching and g. Play, Cassandra, 4 ividual countries aconomic freedom.
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course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practice           NI-PSL         Programming in Scala           The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance I advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful Scalaz, etc.           FIT-SEP         World Economy and Business           This course is presented in Czech. The course introduces students of technical university to the international business. It does that prediand key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse soc corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.           FI-TOP         Academic writing           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 the write a scientific article, what parts such an article should have, and how the pere review process works. Students will also the their and 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 on the availability of enrolled students.           NI-VYC         Computability           Classical theory of recursive functions and effective computability.           NI-EBLO         Blockchain           <	al experience.       Z,ZK         anguage features - e.g.pattel         I frameworks and libraries e.         Z,ZK         dominantly by comparing indicates as well as indexes of e in the form of discussions to the form of gublication of the semester. Dates will be compared to the semester. Dates will be compared to the semester. Dates will be compared to the semester and the semester. The semester compares the students for the prepares the students for the prepares the students for the course places an increase of the prepares the students for the course is fit for any the course is fit for any the prepared to the course is fit for any the prepared to the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the course is fit for any the course of the cou	4         arrn matching and g. Play, Cassandra,         4         ividual countries         acconomic freedom,         based on individual         2         n. Writing scientific         s will learn how to         every scientific         b able to design,         4         5         I be able to design,         4         2         e in 5 days. During         id finishing with         2         color theory, which         one who wants to         a.         4         rse is intended to         5

NIE-PML Personalized Machine Learning	Z.ZK	5
Personalized machine learning (PML) is a sub-field of machine learning that aims to create models and predictions based on the unique characteris	stics and behaviors	s of individual
entities. While PML is commonly used in applications such as recommender systems, which recommend items to users based on their personal inter-	erests, its principle	s can be applied
to a wide range of other fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from th	eoretical, algorithn	nic, and practical
perspectives. Specifically, we will focus on cutting-edge models that are of interest to both the research and commercial communities.		
NI-AML Advanced machine learning	Z,ZK	5
The course introduces students to selected advanced topics of machine learning and artificial intelligence. The topics present techniques in the field of	f recommendation	systems, image
processing, control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with the	methods discusse	ed.
NIE-PDL Practical Deep Learning	KZ	5
This course is designed to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine	learning framewo	rk. Throughout
the course, students will develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in fields su	uch as computer vi	ision and natural
language processing.	,	
NI-AOA Completing a professional event	Z	1
The subject is participation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, d	rafting a report, et	c.Such an event
must be approved in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT t	through a website,	infomail, etc.
NI-ATH AlgorithmicTheories of Games	Z,ZK	4
Traditional game theory is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory set	tudies the behavio	ur of agents
(players) of a certain competitive process by designinng a mathematical model and investigating the strategies. The traditional task of classical gam	e theory is to find	the equilibria,
which are the states of the game where no player wants to deviate from his strategy. Due to the recent development of computers, internet, social net	works, online aucti	ons, advertising,
multiagent systems and other concepts the algorithmic point of view is gaining attention. In addition to existential questions we study the problems of	of efficient compute	ation of various
solution concepts. In this course we introduce the basics of game theory of many players, solution concept (usually equilibria) and methods of their	computation.	
NI-APH Architecture of computer games	Z,ZK	4
Students will gain a basic understanding of the various issues in the field of computer games development, especially from a technical point of view, but	also from design a	and philosophical
perspective. They will get a grasp of component-oriented and functional-oriented architecture, game mechanics, decision-making processes and bas	e components that	t form an integral
part of most games. They will also understand the basics of pathfinding, networking and scripting and apply them in practical exercises (labs). An in	nportant part of the	e course is an
implementation of a simple game, with a strong focus on nontrivial game mechanics.	,	
NI-VGA Video Games Architecture	Z,ZK	5
The course covers a wide range of topics, procedures and methodologies related to the development of computer games - from a technical point of	view, but also from	n a design and
philosophical point of view. In the lectures, students will be guided through the history of development, the structure of game engines, component ar	nd functional archit	tecture typical of
game development, physics, graphics, artificial intelligence and multiplayer. The exercises will then cover selected technological topics in greater det	ail, including ways	of implementing
some game mechanics, in the form of practical demonstrations.		
NI-BPS Wireless Computer Networks	Z,ZK	4
Students will learn about the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in	ad-hoc networks,	multicast and
broadcast mechanisms, and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get know	owledge of security	/ mechanisms
for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools		
NI-CTF Capture The Flag	KZ	4
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NI-IBE   Information Security	ZK	2
Students learn information and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and intern	ational standards in	n this area. They
understand methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g., per	enetration testing).	
NI-IVS Intelligent embedded systems	KZ	4
Intelligent embedded systems course for master's degree is focused on high-level technology embedded systems integrating artificial intelligence.	The course is an a	dvance version
of the Intelligent embedded system fundamentals course for the bachelor degree. The aim of the course is to teach students humanoid robot prog	ramming and advar	nce application
development. Lectures provide basis of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, stuc	ents develop advar	nced applications
combining knowledge of various courses like nature inspired algorithms, data mining algorithms, image recognition and web technologies		
NI-IKM Internet and Classification Methods	Z,ZK	4
In this course, the students get acquainted with classification methods used in four important internet, or generally network applications: in spam fil	itering, in recomme	ndation systems,
in malware detection systems and in intrusion detection systems. However, they will learn more than only how classification is performed when so	lving these four kind	ds of problems.
On the background of these applications, they get an overview of the fundamentals of classification methods. The course is taught in a 2-weeks cy	cle with 2-hour leci	ures and 2-hour
exercises. During the exercises, the students on the one hand implement simple examples to topics from the lectures, on the other hand consult it	neir semester tasks	
NI-IOT Internet of Things	7 7K	4
The subject is focused on the area of hardware and software technologies for the strongly growing computer support of various devices. Its goal is	familiarization with	available
development elements (Rasherry P) Arduino Due) and with the language for efficient application development administration (Rasherry P).		available
development elements (trapper) + 1, realing ball and many aggine to ensuin approximate and modification (or or or or ).	774	4
NI-KIR   Combinational meones of Games		4
Iraditional game theory is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory	studies the behavio	our of agents
(players) of a certain competitive process by designing a mathematical model and investigating the strategies. The traditional task of classical ga	me theory is to find	the equilibria,
which are the states of the game where no player wants to deviate from his strategy. Historically, the second big development in game theory of two	player full-informati	on combinatorial
games, was by Conway, Berlekamp and Guy. They developed a theory, originally used for solving end-games in Go, into a full fledged field. The id	ea is to evaluate ga	mes such that
otherwise incompatible games can be added, that is, played simultaneously. This led to the algrebraic approach to study combinatorial games. The	third most importa	int step is the
work of Beck, who established the theory of positional games (like tic-tac-toe and hex). In analysis of these game, one cannot escape the brute-for	ce traversal of the	game tree, which
is no efficient. Beck introduced the "false probabilistic method", which aims to tackhle this problem. In this course we build the foundation of the the	eory of combinatoria	al and positional
games. We focus on theoretical analysis of games and building the theory, not on the programming aspects of game solving algorithms. The course	e requires indepen	dent work, ability
to mathematically analyse, think and proof. The course is also suitable for bachelors student in the third year, who attended introduction to graph the	neory, as well as for	r PhD students
looking for research topics.		
NI-FMT Finite model theory	Z,ZK	4
The aim of the course is to introduce students to the basics of finite model theory. The original motivation is the questions expressibility and verifiab	ility of logical prope	rties of database
systems. Since its inception in the 1970s, the course has evolved rapidly and touched on many other areas of theoretical computer science, such a	as descriptive comp	elexity theory, the
Constraint Satisfaction Problem (CSP), the theory of algorithmic meta-theorems and combinatorics.		
NI-CCC Creative Coding and Computational Art	KZ	4
Students work on practical tasks, get acquainted with creative and vet proven methods of visualizing various types of data. The course freely follow	s the basic graphic	s courses (MGA.
BLE) and introduces students to suitable visualization methods for traditional as well as for open data. It combines well-known visualization techn	iques with artistic m	ethods using
modern technologies. The aim is to create an interesting visualization project. It is planned to work closely with IPR CAMP (Center of Architecture	and Metropolitan P	lanning) and IIM
(Institute of Intermedia FEL).		annig) and nin
	71/	5
INI-RID Cydeiniaity Cyderte actorgweitad with the fundementale of legislation and international activities in the area of fickting subarating. Cyderte will understan		j J
Students get acquainted with the fundamentals of legislation and international activities in the area of righting cybercrime. Students will understand	1 the classification (	or attacks and
nave an overview of systems for computer surveillance and trainic monitoring in the cyberspace. Students will also tamilarize themselves with nacket	r activities and ben	avior. The course
Will also discuss the cooperation of the state agencies and subjects dealing with delence of the cyberspace (especially CSIRT and CERT teams).		
NI-LSM2   Statistical Modelling Lab	KZ	5
The topic of LSM2 is advanced multiple target tracking (MTT). This domain covers simultaneous tracking of multiple targets using radar under the p	presence of clutter,	or video tracking.
We aim at the state-of-the-art filters, in particular the PHD (Probability Hypothesis Density) and PMBM (Poisson Multi-Bernoulli) filters.		
NI-LOM Linear Optimization and Methods	Z,ZK	5
Students learn the applications of optimization methods in computer science, economics, and industry. They are aware of practical importance of lin	near and integer pro	ogramming. They
are able to work with optimization software and are familiar with languages used in programming of that software. They get skills in formalization o	f optimization probl	ems in computer
science (such as scheduling of tasks to processors, analysis of network flows), distribution and allocation of resources (transportation problems, tr	avelling salesman	problems, etc.),
issues from economics, and modelling of conflicts via the game theory. They get an overview of computational complexity of optimization problems	s. They get orientati	on in algorithms
in linear programming.		-
NI-MZI Mathematics for data science	Z.ZK	4
In this course, students are introduced to those fields of mathematics that are necessary for understanding standard methods and algorithms used	d in data science T	he studied topics
include mainly linear algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality p	rinciple gradient m	ethods) and
selected notions from probability theory and statistics	intelpre, gradient m	
	7.7%	5
		5
NI-NLM   Neural Language Models	Z	5
In this course, students will learn the technical foundations of the Transformer architecture as well as the practical aspects of using language mode	Is. The goal of the c	ourse is to teach
students how to use language models to solve problems, make informed risk assessments, and work critically with the scientific literature.		
NI-NMS Neural Networks, Machine Learning and Randomness	Z,ZK	4
Stochastic methods, i.e. methods based on randomness, are extremely important for the construction and training of neural networks as well as a	number of other ma	achine learning
models. The course "Neural networks, machine learning and randomness" will discuss in sufficient depth a number of specific types of neural networks	vorks that rely subs	tantially on
randomness, as well as a number of specific stochastic methods for neural networks and machine learning. In the final two topics, it explains the ge	neral stochastic ap	proach to training
neural networks and shows that, in addition to the use of randomness in neural networks and machine learning, machine learning models, including	ng neural networks	are used in one
of the most important applications of randomness stochastic optimization methods, which include e.g. popular evolutionary algorithms.		
NI-NMU New media in art and design	ZK	3
The course introduces students to the issue of using new media in artistic and design work. Key topics are moving image, internet, computer gam	e and sound The m	nain goal is to
familiarize the student with the largest possible range of creative approaches in new media. The subject emphasizes dialogue with students, especially approaches in new media.	cially in lectures de	voted to specific
art projects.	,	
NI-ARI Computer arithmetic	774	1
Students will learn various data representations used in digital devices and will be able to design arithmetic operations implementation write	∠,∠r	4
	71/	
	_ ∠K	4
The course builds on graphic courses (mainly BI-PGA and BI-PGR) and the knowledge from these courses is deepened by state-of-the-art knowled	ge. The course is de	esigned for those
interested in advanced computer graphics. Students will gain practical knowledge with realistic texturing and raytracing methods. An integral part of	t the course is the	study of scientific
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas a	ind topics of compu	iter graphics.

	Z,ZK	5		
I ne Computer vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processin	g.Students will get	acquainted with		
the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theore	tical knowledge as	well as on		
practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color representations, object detection				
and recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (incl	uding CNN, RCNN	N, YOLO, ViT),		
motion detection, visual expressiveness (saliency).				
NI-EDW Enterprise Data Warehouse Systems	Z,ZK	5		
The Enterprise Data Warehouses course focuses on the area of business intelligence. Students will be introduced to business intelligence methods	and will gain prac	tical knowledge		
not only in designing warehouses and various architectures, but also their deployment and maintenance. This course also includes an introduction t	o the area of repol	rting and data		
Ni DV(D	1/7	4		
NI-PVR Advanced virtual Reality	KZ   odols in Blondor a	4		
things, it introduces students to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will	also deal with crea	ting applications		
in available 3D engines (mainly Unitv3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the	e knowledge gaine	ed in this subject		
in virtual reality, or directly create a complex game for VR.		, <b>, ,</b>		
NI-IOS Advanced techniques in iOS applications	KZ	4		
Students will learn the latest trends in mobile development technologies for iOS platform. Class covers advanced topics, students need to know all the	ne basics from the	beginners class		
BI-IOS.				
NI-APT Advanced Program Testing	Z,ZK	5		
Testing a program is essential to ensure that a program respects its specification, that changes do not introduce regressions or security issues. The	goal of the course	is to present		
advanced program testing techniques, beyond writing unit tests, especially fuzzing and symbolic execution.				
NI-PVS Advanced embedded systems	Z,ZK	4		
The course is focused on ARM processors and microcontrollers and their usage in wide range of applications. The course includes a series of adva	nced topics like se	curity support,		
working with mass storage devices, motor control, system control and industrial communication. The students obtain both theoretical and also pract	ical experiences w	ith embedded		
systems.				
NI-DNP Advanced .NET	Z,ZK	4		
Students will acquire an overview of platform .NET and will gain knowledge about technologies ASP.NET Core, Entity Framework Core, .NET MAUI	(WPF, UWP), Blaz	zor and also will		
get notions of Azure DevOps and GIT. Students will get practical experience in semestral work where they will create a client-server application utilized a second server application utilized as a second ser	zing technologies	ASP.NET Core,		
Entity Framework Core and (Blazor, .NET MAUI or WPF) and also Azure DevOps and GIT.				
NI-PYT Advanced Python	KZ	4		
The goal of this course is to learn various advanced techniques and methods in Python. The course indirectly continues where Programming in Python.	ion (BI-PYT) left o	f. The course is		
very hands-on and it has only tutorials, everything is demonstrated on examples. Classification is based on work in class as well as semestral coursev	ork. The course is	lead by external		
	1/7			
NI-GOL Programming of distributed systems in GO	KZ	5		
	KZ	4		
NI-ROZ   Pattern Recognition	Z,ZK	5		
I he aim of the module is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the second terms and applications and applications of the second terms and applications of the second terms and applications and applic	statistical approact	n to pattern		
NUCLE Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, a				
NI-PLS I Programming Language Seminar of a reading group in which is programming languages. It has the format of a reading group in which	Z			
about programming languages and related fields. Participating students are expected to present a paper of their interest and actively participate in t	he discussions Th			
is a joint venue between FIT and MFF CUNI. It is open to all students and researchers interested in programming languages.		e reading group		
NI-PLS3 Programming Language Seminar	7	2		
The Programming Language Seminar aims to introduce students to research in programming languages. It has the format of a reading group in whi	ا 🗠 🗠 ا	entific papers		
about programming languages and related fields. Participating students are expected to present a paper of their interest and actively participate in t	he discussions. Th	e reading group		
is a joint venue between FIT and MFF CUNI. It is open to all students and researchers interested in programming languages.				
NI-PL S2 Programming Language Seminar	7	2		
	L 2	2		
The Programming Language Seminar aims to introduce students to research in programming languages. It has the format of a reading group in whi	∠ ∠ ch we discuss scie	∠ entific papers		
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PI-SCN	Seminars on Digital Design	K _	4
synthesis and optimiza	problems of realization and implementation of digital circuits - both combinational and sequential. Basic means of description	of digital circuits	and basic logic
	Machine Learning in Practice	7 7k	5
Applying machine learn	ing methods to real projects in practice involves many other necessary tasks - from understanding the intentions of the client to	ideally, technical	implementation.
The course guides stud	ents through all phases of a project according to the standard CRISP-DM methodology, not only theoretically but also practic	ally. The aim is to	experience real
data processing and lea	arn how to describe the whole process from exploration to evaluation of the model performance in the form of a clear and unc	derstandable repo	rt.
NI-SEP	World Economy and Business	Z,ZK	4
This course is presente	d in Czech. However, there is an English variant in the program Informatics (N1801 / 4793). The course introduces students of	of technical univer	sity to the
international business.	t does that predominantly by comparing individual countries and key regions of world economy. Students get to know about of	different religions	and cultures,
necessary for doing bu	siness in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed	d for the right inve	stment decision.
Seminars help to impro	ve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course	e BIE-SEP as a p	rerequisite.
NI-IVK	VIITUAI Reality lechnology	Z,ZK	3
tracking hand tracking	eve tracking) will be discussed. Furthermore, the concents of mixed and augmented reality will be introduced. Finally, ways of	of using virtual and	d augmented
reality will be presented			augmenteu
NI-TS1	Theoretical Seminar Master I	Z	4
Theoretical seminar is i	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classifier the students which want to come in deeper contact with contemporary theoretical computer science.	ssical reading gro	up. 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	s a work with scie	ntific papers and
other scholarly literatur	e. The capacity is limited by the the potentials of the teachers of the seminar.		
NI-TS2	Theoretical Seminar Master II	Z	4
Theoretical seminar is i	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	ssical reading gro	up. 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	s a work with scie	ntific papers and
	The capacity is inflited by the the potentials of the teachers of the seminar.	7	Λ
INI-153	I neoretical Seminar Master III		4 up 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	s a work with scie	ntific papers and
other scholarly literatur	e. The capacity is limited by the the potentials of the teachers of the seminar.		
NI-TS4	Theoretical Seminar Master IV	Z	4
Theoretical seminar is i	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classified of the students which want to come in deeper contact with contemporary theoretical computer science.	ssical reading gro	up. 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	s a work with scie	ntific papers and
other scholarly literatur	e. The capacity is limited by the the potentials of the teachers of the seminar.		
NI-TKA	Category Theory	Z,ZK	4
NI-TNN	Theory of Neural Networks	Z,ZK	5
In this course, we study	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory	y. At first, we recal	I basic concepts
In this course, we study pertaining to artificial ne	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory eural Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission work training, and the release time is neural networks. In connections with network tanglage, we get acquisited with its transfer	y. At first, we recal on, network topolo	I basic concepts ogy, somatic and
In this course, we study pertaining to artificial ne synaptic mappings, net and in connection with	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory eural Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission work training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transfor somatic and synaptic mappings with their composition into mappings computed by the Network. Finally in connection with tra-	y. At first, we recal on, network topolo rmation into a can aining, we pay atte	Il basic concepts ogy, somatic and onical topology, antion to the
In this course, we study pertaining to artificial ne synaptic mappings, net and in connection with problem of overtraining	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory everal Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission work training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transfor somatic and synaptic mappings, with their composition into mappings computed by the Network, Finally in connection with tra- and to the fact that training is actually a specific optimization task, recalling the most typical objective functions and the most	y. At first, we recal on, network topolo rmation into a can aining, we pay atte important optimiz	I basic concepts ogy, somatic and onical topology, ention to the cation methods
In this course, we study pertaining to artificial ne synaptic mappings, net and in connection with problem of overtraining employed for neural net	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory eural Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission work training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transfor somatic and synaptic mappings, with their composition into mappings computed by the Network, Finally in connection with tra- and to the fact that training is actually a specific optimization task, recalling the most typical objective functions and the most work training. We will see the meaninig of all these concepts in the context of common kinds of forward neural networks. Within	y. At first, we recal on, network topolo rmation into a can aining, we pay atte i important optimiz the topic approxim	I basic concepts ogy, somatic and onical topology, ention to the cation methods nation approach
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In this course, we study pertaining to artificial ne synaptic mappings, net and in connection with problem of overtraining employed for neural net to neural networks, we theorem). Afterwards, v	neural networks from the point of view of the theory of function approximation and from the point of view of probability theory available training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transfor somatic and synaptic mappings, with their composition into mappings computed by the Network, Finally in connection with tra- and to the fact that training is actually a specific optimization task, recalling the most typical objective functions and the most work training. We will see the meaning of all these concepts in the context of common kinds of forward neural networks. Within first notice the connection of neural networks to expressing functions of many variables using functions of fewer variables (Kor we will see how the universal approximation capacity of neural networks can be mathematically formalized as the sets of mapping the works is a the sets of mapping of the set of the sets of th	y. At first, we recai on, network topolo rmation into a can aining, we pay atte i important optimiz the topic approxim olmogorov theorer ings computed by	Il basic concepts ogy, somatic and onical topology, ention to the cation methods mation approach n, Vituškin neural networks
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#### NI-ZS30 Master internship abroad for 30 credits

Ζ 30 The course is prezented in chzech language. Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.

#### List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A2L The content of the active part in the tests with the succe	English language, preparation for the B2 level exam 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 th ass rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind class of the term.	Z - students are due he midterm and the ividual teachers du	2 to: -Take an final term ring the first
BI-ACM	Programming Practices 1	K7	5
Briton	This is a selective course for preparing talented student for representation in international programming contests.		Ū
BI-ACM2	Programming Practices 2 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM3	Programming Practices 3	KZ	5
BLACMA	Programming Practices /	K7	5
	This is a selective course for preparing talented student for representation in international programming contests.		5
BI-ADW.1	Windows Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
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.	1 ,	
BI-AND.21	Programming for the Android Operating System This course is presented in Czech.	KZ	4
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
The content of the	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement	- students are due	to: -Take an
active part in the tests with the succe	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both th ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind class of the term.	he midterm and the ividual teachers du	final term ring the first
BI-ARD	Interactive applications on Arduino	KZ	4
The subject is desig	Ined for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple application of the students of first grade of bachelor study as introduction to embedded systems.	tions for modern pro	ogrammable
not only on displa	ried peripherals with help of available libraries. The goal of the subject is to snow varied software approaches to control embedded s by of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students.	is suitable even for	Web and
BI-AVI.21	Algorithms visually	Z,ZK	4
The course comple knowledge presente	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so ed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org&	cience that extend s lt;http://www.algovis	ubstantially ion.org>)
	that make understanding the principles of algorithms easy.		
BI-BLE	Blender de la suite de la Genetie Andientiere) envent his interded fonteer	Z,ZK	4
animation It c	as knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those i iffers a complete and practically oriented introduction to Blender environment. Students may continue to BLPGA (Programming grap	interested in 3D gra hics applications) c	aphics and
BI-CCN	Compiler Construction	7 7K	5
This is an introdu	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for st	udents to
understa	nd the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class	3.
BI-CS1	Programming in C#	KZ	4
The goal of the cou	rse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co	onstruction, types of	of variables,
constructors, meth	ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging well as work with files are emphasized.	and exception pro	cessing, 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 Micros	soft platform. The s	tudents will
get to know object	s used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current tech	nologies such as L	INQ - a set
of features for que	rying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (I	LINQ to Objects, LI	NQ to XML
(ORM). This part o	f the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mode (XML description).	l, Storage Model a	nd Mapping
BI-CS3	Language C# - design of web applications	K7	4
The students will be	introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview on thisplatform. They will learn to create WebAPI and to use it by client programs.	of the development	possibilities

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-EJK	Enterprise Java and Kotlin tyanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise information	L,ZK	4 microservice
	architecture, that can be deployed to the cloud.	aon systems warn	THICIDSEI VICE
BI-EP1.24	Effective programming 1 The course is taught in Czech.	KZ	4
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Ef	ficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indivi- with the aim to choose the best one and avoid implementation errors	idual problems are	discussed,
BI-HAM	HW accelerated network traffic monitoring	K7	4
This course introd	duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The	he monitoring and	analysis of
network traffic are	mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a	source of informati	ion and data
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 level and to develop their practical abilities in this field.	fic on a hardware a	and software
BI-HAS	Human Aspects in Cryptography and Security	Z,ZK	5
This course is for s	students interested not only in technical scope of computer science, but also in making products usable - for users and for developer	s. Students of this	course can
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.	7.76	2
	This course is presented in Czech.	2,2N	
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech.	KZ	4
BI-KOT	Programing in Kotlin	Z,ZK	4
Kotlin is a modern	n, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adva	nced language co	nstructions.
The language is fu	Ily Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a with minimum of beiler plete code Lest but not least. Ketlin is guitable for designing of DSLs / Demain Specific Lenguages	modern, object-fur	nctional way
BI-KSA	with minimum of bolief-plate code. Last but not least, Kotim is suitable for designing of DSLs (Domain-Specific Languages	). 7K	2
The one-semester	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversit	∣ ∠r ty of the world - ex	amples from
anthropological res	earch from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, healt	h, history, death, e	etc) will be
	shown. The course is presented in Czech.		
BI-MIT	Mikrotik technologies	KZ	3
The main motivation	on of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are con vice providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the m	mmonly used by th	ne small and
and how to adminis	trate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer n	etworks concepts I	like protocols
	and technologies of the data-link, network and transport layer of the OSI model.	·	
BI-MMP	Multimodia team project		
BINNI	Multimedia team project	KZ	4
	This course is presented in Czech.	KZ	4
BI-MPP.21	This course is presented in Czech. Methods of interfacing peripheral devices and on methods for interfacing of peripheral devices is focused on techniques based on University	KZ	4
BI-MPP.21 The course is focus includes both PC s	This course is presented in Czech. Methods of interfacing peripheral devices ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universi- ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USI drivers, simple application development, and APIs of selected devices.	KZ Z,ZK al serial bus (USB) B devices, Linux a	4 5 ). The course and Windows
BI-MPP.21 The course is focus includes both PC s BI-MVT.21	This course is presented in Czech. Methods of interfacing peripheral devices red on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universi- ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USI drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies	KZ       Z,ZK       al serial bus (USB)       B devices, Linux a       Z,ZK	4 5 ). The course and Windows 5
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BI-MPP.21 The course is focus includes both PC s BI-MVT.21 The goal of the con- high resolution disp BI-ORL The subject aims to Operatio BI-PJV BI-PKM BI-PKM Students will be work BI-PS2 Students gain a get BI-QAP Course aims at givi are based, and alg on Python language BI-QUA This course intro- development and w analysis, design BI-SCE1 The Seminar of Con-	This course is presented in Czech. Methods of interfacing peripheral devices is focused on techniques based on Univers. ide and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of US drivers, simple application development, and APIs of selected devices. Modern Visualisation Technologies urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augr lays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mention and procedural visualization, scientific data visualization, and 3D model scanning. Operations Research and Linear Programming introduce students to the issues of operational research and primarily to the practical application of linear programming as a funda nal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (su Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematica rking with modern technical and scientific software. Students will learn how to use different programming styles (functional program etc.), how to create dynamic interactive applications and visualisations, data processing and presentations. Programming in Shell 2 neral overview of available scripting languages, their syntax, semantics, programming We focus on fundaments of quantum mechanics, co orithms showing advantage and limitations of quantum computers. During tutorials students work in open-source software develop 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-VMM might be an advantage. No previous knowledge of physics is assumed. Quality Assurance duces students to the fundamentals of testing and quality management. Studen	KZ         Z,ZK         al serial bus (USB)         B devices, Linux a         Z,ZK         nented reality, visued technologies, no         KZ         mental optimization         ch as management         Z,ZK         Z,ZK         Z,ZK         ion, they gain a de         KZ         on which quantum         KZ         of different types of diffe	4       5       ). The course and Windows       5       ualization on amely fractal       5       1       5       on technique.       1       4       4       4       5       attraction on technique.       attraction       4       5       attraction       4       5       attraction       5       attraction       5       attraction       5       attraction       4       5       attraction       4       5       attraction       4       5       5       5       5       5       4       5       5       5       4       4       4       5       5       5       5       5       6       6       6       6       6       6       6       6       6       6       6

articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each

	semester.		
BI-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Cor	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	o failures and attack	s. 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 wit	th scientific
articles and other p	solessional iterature and/or work in K in laboratories. The capacity of the subject is inflited by the possibilities of the seminar teacher semester.	s. The topics are h	ew ior each
BI-SEP	World Economy and Business	Z,ZK	4
This course is pre	sented in Czech. The course introduces students of technical university to the international business. It does that predominantly by co	omparing individua	l countries
and key regions of	world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as	indexes of econom	nic freedom,
corruption and eco	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 bacheler level of this source RIE SER as a proroquisite.	scussions based o	n individual
BI-SK   21		7 7K	1
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	per insight
0 0	into shell and some other particular scripting languages and will get practical experience with shell script programming.		
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based on	knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa	articular stored prog	gram unites,
triggers, recursive of	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of avec, clusters, index organized tables, and materialized views, as well as from the point of view query optimization. Execution plan as	of view of specialize	d database
will be discusse	exes, clusters, index-organized tables, and matchaized views, as well as norm the point of view query optimization. Execution plan and the execution plan and th	acle DBMS and par	tially on
	PostgreSQL.		
BI-ST1	Network Technology 1	Z	3
The subject is or	iented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited	d under the Cisco	Vetacad -
51 070	CCNA1 - R&S Introduction to Networks.		
BI-ST2	Network Technology 2	Z	3
BI-ST3	Network Technology 3	7	3
Students will furthe	r enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during E		courses will
get further extend	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	Z	3
Students will furth	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	presented during E	BI-ST1 and
BI-SI2 courses g	to further extended in BI-SI3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici-	ency, predictability,	extension
Broadcast Multiple	topology, decliny, etc. This module teaches students to compare and mercure while Area Networks and to experience a completely	other type of netw	
Dioducasi mullipi	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manade router and switch	firmware, perform	password
recoveries, and en	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation of the security aspect is treated; students will serve a students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is treated; students will be a student of the security aspect is the security aspect as the security aspect is the security aspect as the security	i firmware, perform on ways while mair	password taining the
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BI-TEX	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation network running. TeX and Typography	n firmware, perform on ways while main Z,ZK	password training the
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BI-VR1	Virtual reality I	KZ	4
Introduction to Virtu	al Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of	i virtual worlds com	munication.
The course focus	es on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves cor	nputational thinking	g, empathy
	and shared social activities.		-
BI-VR2	Virtual reality II	KZ	3
Continuation of the	for computer science and gamification in various social metaverse and deskton engines	clive is to develop a	applications
BI-ZIVS	Intelligent Embedded System Fundamentals	K7	4
Intelligent embedd	ed system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of	the course is to tea	ch students
modern humanoid	robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion cont	rol, sensor reading	, application
interfaces, robot na	avigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get	practical experience	e with these
	technologies.		
BI-ZPI	Process engineering	KZ	4
Students will learn	fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process engineering in this subject.	process modelling a	and they will
CASE tools The ro	used notations (UNIL, BPMIN, BORM). The locus in this subject lies in training of practical skills of formalisation and modelling of bus lie of process engineering for information systems development is discussed as well as its importance in the overall context of inform	ness processes us	strategy of
	an enterprise.		, charlogy ch
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 re	search institution.	Before the
internship the Dea	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profession	onal content and ex	tent of the
internship. Auxiliary	v courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits cor	respond to 4 weeks	s of full-time
employment with a	toreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided in	to two subjects if th	e internship
BI_7920	exceeds the academic year's dead-line.	7	20
Fach student can	ן once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re	<u> </u>	∣ ∠∪ Before the
internship the Dea	an of the FIT. or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content.	onal content and ex	tent 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 cor	respond to 4 weeks	s 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 in	to two subjects if th	e internship
	exceeds the academic year's dead-line.		1
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 re	search institution.	Before the
internship Auxiliar	an of the FT, of the vice-deam of study analis assesses the professional content. The student must provide evidence of the professional content. The student must provide evidence of the professional content.	respond to 4 week	s 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 in	to two subjects if th	e internship
	exceeds the academic year's dead-line.	,,	
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
	This course is presented in Czech.		
BIE-ADW.1	Windows Administration	Z,ZK	4
Students unders	tand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the	standard administr	ation and
Security tools a	heterogeneous systems. Students are able to effectively configure centralised administration of a computer network	methous and adm	IIIISIIale
BIE-CCN		7 7K	5
This is an introdu	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for st	udents to
understa	ind the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class	s.
BIE-CSI	Introduction to Computer Science	Z	2
This is an introduct	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fi	elds but interested	in computer
science, high-scho	pol students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The g	oal of the class is to	o introduce
and relate basic p	rinciples of computer science for students to understand, early on, what computer science is, why things such as high-level program	ming languages an	tor agion of
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 intere-	sted in computer so	cience more
queenene sur aloo	than expected, or even less than before.	sida in compator oc	
BIE-CZ0	Czech Language for Foreigners	KZ	2
	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Tim	e, Family.	
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2
The course is inte	nded for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The	e course further ex	pands the
basic	c vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the	Czech Republic.	
	Differential equations	Z,ZK	5
This course provide	es a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential s	olution methods like	e separation
polynomial analy	sis, followed by examples of non-linear models such as predator-prev and epidemiological models to showcase real-world applicatio	ns. Finally, an intro	duction to
partial differential	equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs	s and PDEs, includi	ing implicit
	and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-EHD	Introduction to European Economic History	Z,ZK	3
The course introdu	uces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco	onomy through the	description
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 tragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institut	ions is deciphered.	tory Class
	meetings will consist of a mixture of lecture and discussion.	nganizations in his	ioi y. UidSS
BIE-EPR	Economic project	Z	1
This course is an e	xtension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will	contact you before	the start of
	the semester.	-	

BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector	has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on	the issue of credit	risk, and
globalization of ma	rket activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activitie	es, many firms need	d graduates
from technical sch	ools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of fin	ancial markets. The	e Financial
Markets cours	e thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistic	cal tools used in thi	s field.
BIE-HAS	Human Factors in Cryptography and Security	Z,ZK	5
This course is for	students interested not only in technical scope of computer science, but also in making products usable - for users and for developer	s. Students of this of	course can
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh ar	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	able to apply them i	in particular
	examples.		
BIE-PJV	Programming in Java	Z,ZK	4
The course Progra	mming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java la	inguage the fundar	nental APIs
	will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.		
BIE-PKM	Preparatory Mathematics	Z	4
	The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics		
BIE-PRR.21	Project management	Z,ZK	5
The aim of the co	urse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, ana	lysis, crisis manage	ement in a
project, communio	cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as	sessment and mar	nagement,
Gantt charts, rese	purce schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st	udents who are inte	erested in
deepening their k	nowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in la	ge companies. The	e course is
	also suitable for all those who will develop software or hardware in the form of team projects.		
BIE-PS2	Programming in shell 2	Z,ZK	4
Students get a gen	eral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit	ion, they gain a de	eper insight
into Bourne Again s	shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus st	udents: We are rea	dy do adapt
the lectures to pro	vide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, In,	mkdir, rm) and u	seful basic
data filtering tool	s (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a sel	ection of advanced	scripting
	techniques used in practice.		
BIE-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Co	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	o failures and attack	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 wit	th scientific
articles and other p	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teache	rs. The topics are n	ew for each
	semester.		
BIE-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Co	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	o failures and attack	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 wit	th scientific
articles and other p	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teache	rs. The topics are n	ew for each
	semester.		
BIE-SEG	Systems Engineering	Z	0
This is an introduct	ory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of	operating systems	for students
to understand proc	essor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking	the class, students	are able to
understand the	difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what con	ncurrency is, as op	posed to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-SEP	World Economy and Business	Z,ZK	4
The course introd	uces students of technical university to the international business. It does that predominantly by comparing individual countries and k	ey regions of world	l economy.
Students get to	know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor	n, corruption and e	conomic
development, whic	h are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indiv	ridual readings. It is	advised to
	take bachelor level of this course BIE-SEP as a prerequisite.		
BIE-SKJ.21	Scripting Languages	Z,ZK	4
Join us on a tour in	to the world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry standard	ds, as well as a cou	ple of other
standard text proce	essing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. We w	vill provide a gener	al overview
of scripting langua	ges and introduction into their pros and cons and students get practical experience with shell script programming. We will touch also	ROFF, PerlDoc, an	d even TeX
to get some insight	into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you adva	nced programming	techniques
and tricks that get o	verlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the script	ing world. Lukáš is	a renowned
lecturer in advance	ad shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whose	e code contributes	to safe and
	streamline operations of cloud service datacenters around the globe.		
BIE-ST1	Network Technology 1	Z	3
The course is for	cused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad cur	riculum, CCNA1 - I	K&S
	Introduction to Networks.		
BIE-TUR.21	User Interface Design	Z,ZK	5
Students gain a b	asic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where softwa	are and other produ	ucts do not
communicate with	the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gai	n an overview of m	ethods that
	bring users into the development process to ensure optimal interface for them.		
BIE-VAK.21	Selected Combinatorics Applications	Z	3
The course aims to	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the b	asic courses, we a	pproach the
issue from applicat	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	data structures. F	urthermore,
with the active part	ticipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info	ormatics. Areas from	n which we
will select problem	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimiz	ation and more. Stu	udents will
	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		

The lecture heating	Selected Mathematical Methods	Z,ZK	4
	with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then add	dress Fourier series	s and their
properties. Furthei	, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wave linear programming problem in more detail and its solution using the Simpley algorithm. Each tonic is demonstrated with interesting	avelet transform. W	e examine
BIE_\/P1 21			1
Introduction to Vir	ual Reality (VR), virtual reality operations, metaverse, and creation, Rules and requirements for virtual worlds communication. The communication are set of the set	ourse focuses on th	ne ways of
	creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social	activities.	.0
BIE-ZRS	Basics of Systems Control	Z,ZK	4
Optional subject B	asics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the	field of automatic	control will
be definitely evalu	ated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus	s our attention part	icularly on
control of engineer	ing and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teac	ch you description i	methods of
system models, bas	ic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in a description of the system model, the basic linear dynamic systems analysis and design verification and simple DID feedback. PSD (	n which students w	ill learn the
is also given to ser	sors and actuators in control loops, issues of stability in control systems, sincle and continuous adjustment of the controller parameter	ers and certain asr	s. Allention
industrial implem	entation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examined	ples and practical i	ndustrial
	implementations.		
FI-TOP	Academic writing	Z	2
Publishing is an im	portant and required part of research activity. It is not only about obtaining research results but also about applying them in the form c	of publication. Writin	ng 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 court	rse, students will le	arn how to
write a scientific art	cle, what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an a	article and reviewin	g 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	ates will be determi	ned based
	Medern IT infractructure	7 71/	F
	World Feenemy and Rusinees		5
	WUTIL ECUTIONITY ATTU DUSTRESS	∠,∠n moaring individua	4 Lountries
and key regions of	vorld economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as	indexes of econom	ic freedom.
corruption and eco	nomic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of di	scussions based o	n individual
	readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
FITE-EHD	Introduction to European Economic History	Z,ZK	3
The course introdu	ces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economic	nomy through the	description
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	vire 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	alled economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	organizations in hist	ory. Class
	World Economy and Burings	7.7%	4
The course introdu	ices students of technical university to the international business. It does that predominantly by comparing individual countries and k	∠,∠r∖ ev regions of world	economy
Students get to	know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom	n, corruption and e	conomic
development, whic	n are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indivi	idual readings. It is	advised to
	take bachelor level of this course BIE-SEP as a prerequisite.		
NI-AFP	Applied Functional Programming	KZ	5
This course is pres	ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional pr	rogramming langua	ages are on
the rise nowadays	and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, masteri	ing this paradigm b	ecomes a
	Advanced machine loarning	7.71	
The course introduc	AUVAILEEU IIIACITIIE TEATITIIS	Z,ZN	<b>E</b> 1
	to students to selected advanced topics of machine learning and artificial intelligence. The topics present techniques in the field of rec	ommendation syst	5 ems image
processing.	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with the	commendation system he methods discus	5 ems, image sed.
processing, NI-AOA	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event	ommendation system he methods discus Z	5 ems, image ised. 1
processing, NI-AOA The subject is parti	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event sipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir	ommendation system he methods discus Z ng a report, etc.Suc	5 ems, image sed. 1 ch an event
processing, NI-AOA The subject is parti must be approved	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event cipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT thro	ommendation syst he methods discus Z ng a report, etc.Suc pugh a website, info	5 ems, image sed. 1 ch an event omail, etc.
processing, NI-AOA The subject is parti must be approved NI-APH	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event cipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT thro Architecture of computer games	ommendation syst he methods discus ng a report, etc.Su ough a website, info Z,ZK	5 ems, image sed. 1 ch an event omail, etc. 4
processing, NI-AOA The subject is parti must be approvec NI-APH Students will gain a	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event cipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT thro Architecture of computer games basic understanding of the various issues in the field of computer games development, especially from a technical point of view, but also	ommendation syst he methods discus ng a report, etc.Suc ough a website, info Z,ZK from design and pl	5 ems, image sed. 1 ch an event omail, etc. 4 nilosophical
processing, NI-AOA The subject is parti must be approved NI-APH Students will gain a perspective. They w	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event cipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT three Architecture of computer games basic understanding of the various issues in the field of computer games development, especially from a technical point of view, but also ill get a grasp of component-oriented and functional-oriented architecture, game mechanics, decision-making processes and base cor	ommendation syst he methods discus Z ng a report, etc.Suc bugh a website, info Z,ZK from design and pl mponents that form	5 ems, image sed. 1 ch an event omail, etc. 4 nilosophical a an integral
processing, NI-AOA The subject is parti must be approved NI-APH Students will gain a perspective. They w part of most game	control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with t Completing a professional event cipation in a one-off professional event, usually a lecture by a foreign guest of the FIT CTU, concluded with a workshop, a test, draftir in advance by the vice-dean for pedagogical activities or the vice-dean for science and research and is presented within the FIT thro Architecture of computer games basic understanding of the various issues in the field of computer games development, especially from a technical point of view, but also ill get a grasp of component-oriented and functional-oriented architecture, game mechanics, decision-making processes and base cor s. They will also understand the basics of pathfinding, networking and scripting and apply them in practical exercises (labs). An impo	ommendation syst he methods discus ng a report, etc.Suc bugh a website, info Z,ZK of from design and pl mponents that form rrtant part of the co	5 ems, image sed. 1 ch an event omail, etc. 4 nilosophical a an integral urse is an
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NI-CPX	Complexity Theory	Z.ZK	5
Students will lear	rn about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the	theory concerning	practical
	(in)tractability of difficult problems.		
NI-CTF	Capture The Flag	KZ	4
	The course is designed to introduce students to CTF competitions and let them gain practical experience in the field of cyber se	curity.	
NI-DDM	Distributed Data Mining	KZ	4
Course focuses or	1) state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of	on experience with	large scale
data processing fr	amework Apache Spark and with existing distributed DM / ML algorithms. The course is prevented in creck language	ind will be capable	to propose
		7	2
The course will intr	roduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, persc	l Color th	eory, which
they will practically	y apply in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The course	is fit for anyone wh	no wants to
practice o	r learn drawing and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practic	ce gained knowled	ge.
NI-DNP	Advanced .NET	Z,ZK	4
Students will acqui	ire an overview of platform .NET and will gain knowledge about technologies ASP.NET Core, Entity Framework Core, .NET MAUI (WF	PF, UWP), Blazor a	and also will
get notions of Azu	re DevOps and GIT. Students will get practical experience in semestral work where they will create a client-server application utilizing	j technologies ASP.	NET Core,
	Entity Framework Core and (Blazor, .NET MAULOR WPF) and also Azure DevOps and GT.	771	
	Game Design	Z,ZK	5 d for pooplo
interested in deer	principles the NFAFH (Architecture of Computer Games) and BFVHS (Virtual gaming worlds) course, while locusing primarity of game of the principles used for games design, such as level design, gameplay design, character design, game mechanics d	lesian storvtelling	and dame
development cycle	. The students will get an overview of game development from the designer's perspective, from theoretical concepts to practical impler	mentation applied t	o semestral
	projects.		
NI-DSP	Database Systems in Practes	Z,ZK	4
	This course is presented in Czech.		
NI-DSW	Design Sprint	Z	2
Students will work	on projects using the Design Sprint method, developed by Google. THanks to this method the teams are able to go from idea to validat	ted prototype in 5 d	lays. During
the course the st	udents will get familiar with the method as participants. Through practical challenges they will try the whole 5 day process starting with	h research and finis	shing with
	Introduction to Dispersto and Computational Coometry	774	F
The course intends	s to introduce the students to the discipline of Discrete and Computational Geometry The main goal of the course is to get familiar with	the most fundame	ontal notions
	of this discipline, and to be able to solve simple algorithmic problems with a geometric component.		intal fiotiono
NI-DZO	Digital Image Processing	Z.ZK	4
This course prese	ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg	jorithms that are bo	oth easy to
implement and hav	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also	so valuable outside	the domain
of digital image	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR	compression, de-b	olurring in
interactive as ri	abstraction, hybrid images, gradient domain editing, seamless image stitching and cioning, digital photo-montage, color-to-gray conviction solution and cioning, digital photo-montage, color-to-gray conviction and consistent domain editing, seamless image stitching and cioning, digital photo-montage, color-to-gray conviction and cioning	ersion, context enr	nancement,
			5
The Enterprise Da	ata Warehouses course focuses on the area of business intelligence. Students will be introduced to business intelligence methods and	۲,۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲۲	knowledge
not only in design	ing warehouses and various architectures, but also their deployment and maintenance. This course also includes an introduction to the	ne area of reporting	g and data
	visualization.		-
NI-ESC	Experimental Project Course	KZ	8
"The Design Proje	ct course offers a holistic exploration of the design process, providing students with a well-rounded understanding of the principles, m	nethodologies, and	tools used
in designing techno	plogy-driven solutions that are user-centric and industry-relevant. Throughout the semester, students will work on real-world design pro	jects, collaborate w	vith industry
experts, and lear	to integrate theory with practical application. I hrough a hands-on, project-based learning approach, students will develop their skills	in user-centered c	esign and
	Finite model theory	7 7K	1
The aim of the cou	rise is to introduce students to the basics of finite model theory. The original motivation is the questions expressibility and verifiability of	logical properties	of database
systems. Since its	inception in the 1970s, the course has evolved rapidly and touched on many other areas of theoretical computer science, such as des	scriptive complexity	theory, the
	Constraint Satisfaction Problem (CSP), the theory of algorithmic meta-theorems and combinatorics.		
NI-GLR	Games and reinforcement learning	Z,ZK	4
The field of reinfor	cement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligen	ce. This course is i	ntended to
	give you both theoretical and practical background so you can participate in related research activities. Presented in English	n.	
NI-GNN	Graph Neural Networks	Z,ZK	4
representations of	oduces students to advanced artificial intelligence techniques for working with graphs. Lectures with ocus on the latest graph neural in of nodes, edges and entire graphs. The techniques discussed cover various types of graphs, including time-varying graphs. The last p	art of the course a	lso covers
	graph generation and interpretability of graph neural networks. In the exercises, students will try out selected techniques and pro	blems.	
NI-GOL	Programming of distributed systems in GO	KZ	5
NI-GRI	Grid Computing	Z,ZK	5
	Grid computing and gain knowledge about the world-wide network and computing infrastructure.	· · · ·	
NI-HCM	Mind Hacking	ZK	5
Cognitive security	is an emerging discipline that is closely related to cyber security. While the domain of cyber security is the protection of networks, info	ormation systems a	and assets,
the domain of cog	nitive security is the protection of the human mind from intentional and unintentional digital manipulation. The topic of cognitive securi	ity is growing in imp	portance in
Ine context of infor	nation warrare, increasing digital dependence and the development of artificial intelligence, where these phenomena from the internet inte	environment have r	eai societal
	History of Mathematics and Informatics	7ĸ	3
This course is pr	esented in Czech. Selected topics {Infinitesimal calculus, probability, number theory, general algebra, different examples of algorithm:	s, transformations.	recursive
	functions, eliptic curves, etc.) note on possibilities of applications of some mathematical methods in informatics and its develop	ment.	

IINA I

NI-HSC	Side-Channel Analysis in Hardware	Z,ZK	4
This course is de	dicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attact	ks. Students get fai	miliar with
various kinds of s	ide channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and	get familiar with hi	gher-order
	hey also get practice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel		e.
	Internet and Multimedia		4
presentation of AV	signals (output) network communication protocols device interfaces codecs data formats and stereoscopy. We will look at practical u	use case scenarios	of real-time
audiovisual transr	nissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the eff	ect of various comp	onents on
the quality and late	ncy of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording th	e scene up to the p	resentation
	for audience.		
NI-IBE	Information Security	ZK	2
Students learn info	rmation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d mathede for management of internal and outprocleaguity threads for IS/IT acquity oudite and for application acquity testing (a g	al standards in this	area. They
	the mode for management or internal and external security threats, for 15/11 security addits, and for application security testing (e.g.		g). 1
INI-IMIVI	III.eIII.eL and Classification methods used in four important internet, or generally network applications; in spam filtering	∠,∠n   Lin recommendation	4 on systems
in malware detect	ion systems and in intrusion detection systems. However, they will learn more than only how classification is performed when solving	these four kinds of	problems.
On the background	d of these applications, they get an overview of the fundamentals of classification methods. The course is taught in a 2-weeks cycle w	ith 2-hour lectures	and 2-hour
exercises.	During the exercises, the students on the one hand implement simple examples to topics from the lectures, on the other hand consul	t their semester tas	sks.
NI-IOS	Advanced techniques in iOS applications	KZ	4
Students will learn	the latest trends in mobile development technologies for iOS platform. Class covers advanced topics, students need to know all the b	asics from the begi	nners class
NUIOT	BI-IOS.	7 71/	
NI-IOI The subject is f	INTERNET OF I NINGS	Z,ZK	4 wailablo
	development elements (Raspberry Pi, Arduino Due) and with the language for efficient application development and modification (G	NU Forth).	
NI-IVS	Intelligent embedded systems	KZ	4
Intelligent embede	led systems course for master's degree is focused on high-level technology embedded systems integrating artificial intelligence. The	course is an advar	ice version
of the Intelligent e	mbedded system fundamentals course for the bachelor degree. The aim of the course is to teach students humanoid robot programmed and teach students humanoid and t	ning and advance	application
development. Lect	res provide basis of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students o	develop advanced	applications
	combining knowledge of various courses like nature inspired algorithms, data mining algorithms, image recognition and web tech	nologies	
NI-KTH	Combinatorial Theories of Games	Z,ZK	4
(players) of a cer	theory is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory stur-	beory is to find the	or agents
which are the state	s of the game where no player wants to deviate from his strategy. Historically, the second big development in game theory of two-playe	r full-information co	mbinatorial
games, was by C	onway, Berlekamp and Guy. They developed a theory, originally used for solving end-games in Go, into a full fledged field. The idea is	to evaluate games	such that
otherwise incom	patible games can be added, that is, played simultaneously. This led to the algrebraic approach to study combinatorial games. The thi	rd most important s	step is the
work of Beck, who	established the theory of positional games (like tic-tac-toe and hex). In analysis of these game, one cannot escape the brute-force tra	versal of the game	tree, which
IS NO Efficient. Bec	K introduced the "false probabilistic method", which aims to tackhie this problem. In this course we build the foundation of the theory of theoretical analysis of games and building the theory, not on the programming aspects of game solving algorithms. The course reg	of combinatorial an	d positional
to mathematically	analyse, think and proof. The course is also suitable for bachelors student in the third year, who attended introduction to graph theor	y, as well as for Ph	D students
,	looking for research topics.		
NI-KYB	Cybernality	ZK	5
Students get acq	uainted with the fundamentals of legislation and international activities in the area of fighting cybercrime. Students will understand the	e classification of a	ttacks and
have an overview o	f systems for computer surveillance and traffic monitoring in the cyberspace. Students will also familiarize themselves with hacker activ	vities and behavior.	The course
	vill also discuss the cooperation of the state agencies and subjects dealing with defence of the cyberspace (especially CSIRT and Ci		
NI-LOIVI Students learn the	LINEAL OPTIMIZATION AND METHODS applications of optimization methods in computer science, economics, and industry. They are aware of practical importance of linear a	,∠N	C ming They
are able to work w	th optimization software and are familiar with languages used in programming of that software. They get skills in formalization of optim	nization problems i	n computer
science (such as	scheduling of tasks to processors, analysis of network flows), distribution and allocation of resources (transportation problems, travell	ing salesman prob	ems, etc.),
issues from econo	mics, and modelling of conflicts via the game theory. They get an overview of computational complexity of optimization problems. The	y get orientation in	algorithms
	in linear programming.		
NI-LSM	Statistical Modelling Lab	KZ	5
I ne subject is or	ented on a single and multi-target tracking. The second half of the semester is focused on the design of methods and algorithms, an	d analyses of their	use of the
	At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesi	s).	properties.
NI-LSM2	Statistical Modelling Lab	KZ	5
The topic of LSM2	is advanced multiple target tracking (MTT). This domain covers simultaneous tracking of multiple targets using radar under the preser	ice of clutter, or vid	eo tracking.
	We aim at the state-of-the-art filters, in particular the PHD (Probability Hypothesis Density) and PMBM (Poisson Multi-Bernoulli)	filters.	
NI-MLP	Machine Learning in Practice	Z,ZK	5
Applying machine	earning methods to real projects in practice involves many other necessary tasks - from understanding the intentions of the client to, ide	ally, technical impl	ementation.
I ne course guides	students through all phases of a project according to the standard CRISP-DM methodology, not only theoretically but also practically sing and learn how to describe the whole process from exploration to evaluation of the model performance in the form of a clear and	understandable re	erience real
	Modern Object-Oriented Programming in Pharo	K7	рон. Л
Object-oriented pro	gramming is currently one of the most widespread paradigms of software creation, especially enterprise information systems. where	ا ۲۰۰۰ its ability to natural	abstraction
is used to build con	plex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills	s of design and imp	lementation
of object systems	in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development n	eeds and areas of	interest. In
addition to deepen	ing object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work of	on interesting proje	cts and OO
technologies in te	ms or semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involven	hent in the Pharo C	onsortium.
	Managerial Psychology		2
INI-IVIOI Mathematical or	IVIAITIETTIAIICAL STRUCTURES IN COMPUTER SCIENCE		4 calculue
	Introduction to category theory.		saloulus.

NI-MZI Mathematics for data science	Z,ZK	4
In this course, students are introduced to those fields of mathematics that are necessary for understanding standard methods and algorithms used in data include mainly linear elastic factorization elastic data and algorithms used in data and algorithms u	ta science. The stu	udied topics
include mainly: linear algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality princ selected notions from probability theory and statistics	ipie, gradient meth	iods) and
NI-NI M Neural Language Models	7	5
In this course, students will learn the technical foundations of the Transformer architecture as well as the practical aspects of using language models. The	acal of the course	e is to teach
students how to use language models to solve problems, make informed risk assessments, and work critically with the scientific lit	erature.	
NI-NMS Neural Networks, Machine Learning and Randomness	Z,ZK	4
Stochastic methods, i.e. methods based on randomness, are extremely important for the construction and training of neural networks as well as a number	per of other machin	ne learning
models. The course "Neural networks, machine learning and randomness" will discuss in sufficient depth a number of specific types of neural networl	ks that rely substa	ntially on
randomness, as well as a number of specific stochastic methods for neural networks and machine learning. In the final two topics, it explains the general s	stochastic approac	h to training
neural networks and shows that, in addition to the use of randomness in neural networks and machine learning, machine learning models, including neuronal of the most important applications of randomness stochastic optimization methods, which include e.g. oppular evolutionary algor	iral networks, are i	used in one
NI-NMU	7K	3
The course introduces students to the issue of using new media in artistic and design work. Key topics are moving image, internet, computer game an	ا کانے d sound. The main	goal is to
familiarize the student with the largest possible range of creative approaches in new media. The subject emphasizes dialogue with students, especially i	in lectures devoted	to specific
art projects.		
NI-OLI Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po	werful processors	and FPGAs
increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development of variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development of variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development of variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development of variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development of variability of peripheral subsystems requiring specific software drivers.	nt for master's stud	ents. The
NILDAM Efficient Proprocessing and Parameterized Algorithms		1
There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necess	arv to solve these	problems
exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one	e can find a commo	on property
(parameter) of the inputs from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponent	ntially in this (small	) parameter
and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial tin	ne preprocessing o	of the input,
which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution	n method. We will	present a
pretriora of parameterized algorithm design methods and we will also snow how to prove that for some problem (and parameter) such an algorithm (pre- will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation	schemes	i exist. we
NI-PDD Data Preprocessing	7 7K	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data su	ources, such as im	ages, texts,
time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characterist	tics from images of	r from web
pages.		
NI-PG1 Computer Grafics 1	ZK	4
The course builds on graphic courses (mainly BI-PGA and BI-PGR) and the knowledge from these courses is deepened by state-of-the-art knowledge. The	e course is design	ed for those
interested in advanced computer graphics. Students will gain practical knowledge with realistic texturing and raytracing methods. An integral part of the c	course is the study	of scientific
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t	topics of computer	araphics
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t	topics of computer	graphics.
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t NI-PIV Computer Vision The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing.St	topics of computer Z,ZK udents will get acqu	graphics. 5 uainted with
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t NI-PIV Computer Vision The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing. Stu the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretical	topics of computer Z,ZK udents will get acquical knowledge as w	graphics. 5 uainted with vell as on
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t NI-PIV Computer Vision The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing.Stu the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretic practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color rep	topics of computer Z,ZK udents will get acquical knowledge as w presentations, obje	graphics. 5 uainted with vell as on ct detection
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t         NI-PIV       Computer Vision         The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing. Stu the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color rep and recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (including)	topics of computer Z,ZK udents will get acquical knowledge as w presentations, obje ng CNN, RCNN, Y	graphics. 5 uainted with vell as on ct detection OLO, ViT),
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t NI-PIV Computer Vision The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing. Stu the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretic practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color rep and recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (includi motion detection, visual expressiveness (saliency).	topics of computer Z,ZK udents will get acquical knowledge as w presentations, obje ng CNN, RCNN, Y	graphics. 5 uainted with vell as on ect detection OLO, ViT),
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and to NI-PIV         Computer Vision         The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing.Stutte basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretic practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color reprand recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (including motion detection, visual expressiveness (saliency).         NI-PLS1       Programming Language Seminar	topics of computer Z,ZK udents will get acquical knowledge as w presentations, obje ng CNN, RCNN, Yr Z	graphics. 5 uainted with vell as on ict detection OLO, ViT), 2
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and to NI-PIV         Computer Vision         The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing.Stutte basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretic practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color reprand recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (includit motion detection, visual expressiveness (saliency).         NI-PLS1       Programming Language Seminar         The Programming languages and related fields. Participation students to research in programming languages. It has the format of a reading group in which about programming languages and related fields. Participation students are expected to present a paper of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection of their interest and actively participate in the detection.	topics of computer Z,ZK udents will get acquisal knowledge as w presentations, obje ng CNN, RCNN, Y Z we discuss scienti iscussions. The re	graphics. 5 uainted with vell as on ct detection OLO, VIT), 2 fic papers ading group
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and to         NI-PIV       Computer Vision         The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing.Stu the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretic practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color representing and recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (includi motion detection, visual expressiveness (saliency).         NI-PLS1       Programming Language Seminar         The Programming Language Seminar aims to introduce students to research in programming languages. It has the format of a reading group in which about programming languages and related fields. Participating students are expected to present a paper of their interest and actively participate in the dis a joint venue between FIT and MFF CUNI. It is open to all students and researchers interested in programming languages	topics of computer Z,ZK udents will get acqu cal knowledge as w presentations, obje ng CNN, RCNN, Y Z we discuss scienti iscussions. The real s.	graphics. 5 uainted with vell as on ct detection OLO, ViT), 2 ific papers ading group
articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and t         NI-PIV       Computer Vision         The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing. Stute the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color reprand recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (includie motion detection, visual expressiveness (saliency).         NI-PLS1       Programming Language Seminar         The Programming Language Seminar aims to introduce students to research in programming languages. It has the format of a reading group in which about programming languages and related fields. Participating students are expected to present a paper of their interest and actively participate in the d is a joint venue between FIT and MFF CUNI. It is open to all students and researchers interested in programming languages         NI-PLS2       Programming Language Seminar	topics of computer Z,ZK udents will get acquical knowledge as w presentations, obje ng CNN, RCNN, Y Z we discuss scienti iscussions. The real s. Z	graphics. 5 uainted with well as on ct detection OLO, ViT), 2 fic papers ading group 2
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NI-PVS	Advanced embedded systems	Z,ZK	4
The course is focu	used on ARM processors and microcontrollers and their usage in wide range of applications. The course includes a series of advance	d topics like securi	ity support,
working with mass storage devices, motor control, system control and industrial communication. The students obtain both theoretical and also practical experiences with embedded			
	Advanced Python	K7	1
The goal of this co	purse is to learn various advanced techniques and methods in Python. The course indirectly continues where Programming in Python.	→ BI-PYT) left of Th	ne course is
very hands-on and	it has only tutorials, everything is demonstrated on examples. Classification is based on work in class as well as semestral coursework.	The course is lead	by external
	teachers from Red Hat.		.,
NI-REV	Reverse Engineering	Z.ZK	5
Students will get a	cquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before	ore and after the m	ain function
is called. Students	s will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedica	ted to reverse eng	gineering of
applications wri	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de	edicated to debugg	gers: how
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	he focus of
	the course is on the seminars, where students will solve practically oriented tasks from the real world.	7 71/	<b>_</b>
NI-ROZ	Pattern Recognition	Z,ZK	5
recognition St	induce is to give a systematic account of the major topics in patient recognition with emphasis on problems and applications of the sta- idents will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, and	alistical approach t d their numerical :	aspects
			азросиз. И
INI-RUD	This course is presented in Czech	rz	4
	Computer Engineering Sominar Master I	7	4
The Seminar of Co	COMPUTER ENGINEERING SETTING INVISED I	 failures and attack	4 ks Students
are approached in	inputer Engineering is a (s)elective course of students who want to dear with deeper topics of digital design, reliability and resistance to individually within the subject. Each student or aroun of students solves some interesting tonic with the selected supervisor. Part of the	subject is work wit	th scientific
articles and other	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are n	new for each
	semester.		
NI-SCE2	Computer Engineering Seminar Master II	Z	4
The Seminar of Co	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	failures and attack	ks. Students
are approached ir	ndividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	subject is work wit	th scientific
articles and other	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are n	new for each
	semester.		
NI-SEP	World Economy and Business	Z,ZK	4
This course is p	presented in Czech. However, there is an English variant in the program Informatics (N1801 / 4793). The course introduces students o	f technical univers	ity to the
international bus	iness. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about diff	erent religions and	d cultures,
necessary for doin	g business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for	the right investme	ent decision.
Seminars neip t	o improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course	BIE-SEP as a prei	reauisite.
		7 71	
NI-SYP	Parsing and Compilers	Z,ZK	5
NI-SYP The module builds	Parsing and Compilers	Z,ZK rious variants and	5 applications
NI-SYP The module builds	Parsing and Compilers upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.	Z,ZK rious variants and	5 applications
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NI-TS3	Theoretical Seminar Master III	Z	4
Theoretical semina	ar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic	al reading group. T	he students
	other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	WORK WIT SCIENTING	papers and
NI-TS4	Theoretical Seminar Master IV	7	4
Theoretical semina	ar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic	al reading group. T	he students
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.		
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 pre	pare a test set with	the help of
ine intuitive path s	will be able to compute analyze and control the reliability and availability of the designed circuits	int-in-sen-test equip	oment. They
NI-TVR	Virtual Reality Technology	7 7K	3
Students will be in	troduced to the basic concepts of virtual reality. Techniques for displaying virtual worlds (CAVE, HMD,) and the possibilities of cont	rolling virtual avata	irs (position
tracking, hand tra	acking, eye tracking) will be discussed. Furthermore, the concepts of mixed and augmented reality will be introduced. Finally, ways of reality will be presented.	using virtual and a	ugmented
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will ga	in knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	organizations. The	ey will get
acquainted with vi	irtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	ently operate and o	ptimize the
management of co	maneters of modern computer systems. Theoretically and practically, they will get acquainted with containenzation as the most effect molex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills it	n the use of moder	ay for the
management of co	and development tools (Continuous integration and development).		rintogration
NI-VGA	Video Games Architecture	Z,ZK	5
The course covers	s a wide range of topics, procedures and methodologies related to the development of computer games - from a technical point of vie	w, but also from a	design and
philosophical point	of view. In the lectures, students will be guided through the history of development, the structure of game engines, component and fu	unctional architectu	ire typical of
game developmen	t, physics, graphics, artificial intelligence and multiplayer. The exercises will then cover selected technological topics in greater detail, il some game mechanics, in the form of practical demonstrations.	ncluding ways of in	npiementing
NI-VOI	Flections	7 7K	5
	We will cover the basics of (committee) elections and, in general, opinion aggregation.	2,210	
NI-VPR	Research Project	Z	5
	Student obtains the credits for published scientific outputs. The details are at https://courses.fit.cvut.cz/NI-VPR/en.	1	
NI-VYC	Computability Classical theory of recursive functions and effective computability.	Z,ZK	4
NI-ZS10	Master internship abroad for 10 credits	Z	10
Each student can	once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institu	tion. Before the int	ernship the
Dean of the FIT, or	the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and ex	ktent of the internsh	hip. Auxiliary
a foreign instituti	on The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects.	if the internship ex	ceeds the
	academic year's dead-line.	in the internet of post	
NI-ZS20	Master internship abroad for 20 credits	Z	20
Each student can	once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institu	ition. Before the int	ernship the
Dean of the FIT, or	the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and ex	ktent of the internsh	hip. Auxiliary
a foreign instituti	on. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects	if the internship ex	ceeds the
	academic year's dead-line.		
NI-ZS30	Master internship abroad for 30 credits	Z	30
The course is prea	zented in chzech language. Each student can once within his / her master's degree have a foreign internship at a foreign university or	other foreign scier	ntific and/or
research institution	b. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide a factor and a reliable of the internation of the internati	de evidence of the	professional
to 4 weeks of full-	time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This a	mount can be divid	ed into two
	subjects if the internship exceeds the academic year's dead-line.		
NIE-AM2	Middleware Architectures 2	Z,ZK	5
Students will learn	new trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architecture	es, concepts and te	echnologies
<b></b>	for microservices, distrubuted cache and databases, smart contracts, realtime communication and web security.		
NIE-ARI	Computer arithmetic	Z,ZK	4
	Success will learn various data representations used in digital devices and will be able to design arithmetic operations implementa		F
Students will under	DIUCKUTIAITI	∣ ∠,∠∩ ms. They will be ab	U le to design
code and deploy a	a secure decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course places	an increased emph	hasis on the
relationship betwe	een blockchains and information security. It is concluded with a defense of a research or applied semester project, which prepares the	e students for imple	ementing or
	supervising implementation of blockchain-based solutions in both academia and business.		
NIE-BPS	Wireless Computer Networks	Z,ZK	4
broadcast mecha	n about the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in ad nisms, and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get knowle	edge of security m	echanisms
	for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suitab	ble tools.	
NIE-CPX	Complexity Theory	Z,ZK	5
Students will lea	rn about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the	theory concerning	g practical
	(in)tractability of difficult problems.		_
NIE-DDW	Web Data Mining	Z,ZK	5
students will lea	am rarest memors and rechnologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gain a crawling. Web structure analysis. Web usage analysis. Web content mining and information extraction. Students will also gain an overvie	an overview of We	evelopments
	in the field of social web and recommendation systems.		
L	,		

NIE-DVG	Introduction to Discrete and Computational Geometry	Z,ZK	5
The course intends	to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with	the most fundame	ntal notions
	of this discipline, and to be able to solve simple algorithmic problems with a geometric component.		
NIE-EVY	Efficient Text Pattern Matching	Z,ZK	5
Students get knowle	edge of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient in both access	s time and memory	complexity.
	They will be able to use the knowledge in design of applications that utilize pattern matching.		
NIE-HMI	History of Mathematics and Informatics	Z,ZK	3
The course focuse	es on selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer sci	ence The topics ar	e selected
for finding so	ome relations between computer science and mathematical methods. Some examples of applications of mathematics to computer sc	ciences will be sho	wed.
NIE-HSC	Side-Channel Analysis in Hardware	Z,ZK	4
This course is de	dicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attacl	ks. Students get far	miliar with
various kinds of si	de channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and	get familiar with hi	gher-order
attacks. T	ney also get practice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel	information leakag	e.
NIE-MVI	Computational Intelligence Methods	Z,ZK	5
Students will under	stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parall	el in nature and ar	e applicable
to solving a wide rai	nge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students	s will learn how the	se methods
	work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et	ic.	
NIE-PAM	Parameterized Algorithms	Z,ZK	4
There are many c	ptimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necess	sary to solve these	problems
exactly in practice.	We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one	e can find a commo	on property
(parameter) of the i	puts from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponen-	ntially in this (small	) parameter
and polynomially in	the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial tit	ne preprocessing o	of the input,
which is not poss	ible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution	on method, we will	present a
pietriora or parami	sterized algonum design methods and we will also show how to prove that to isome problem (and parameter) such an algonum (bit)	esumably) does no	t exist. we
	will also not mission the relations to other approaches to hard problems such as moderately exponential algorithms of approximation	i schemes.	
NIE-PDL	Practical Deep Learning	KZ	5
I his course is des	gned to provide students with a comprehensive understanding of Deep Learning using Py forch, a popular open-source machine lea	arning framework. I	nrougnout
the course, student	s will develop practical skills in building and training deep neural networks, using Py forch to solve real-world problems in neurs such a	as computer vision	and natural
		7 71/	
NIE-PIML	Personalized Machine Learning		5
Personalized mad	nine learning (PME) is a sub-lieu of machine learning trait aims to cleate models and predictions based on the unique characteristic	s and benaviors of	individual
to a wide range of o	is commonly used in applications such as recommender systems, which recommend tens to users based on their personal meters that the fields and user and chamical and partial and partial and the source we will evolve the latest PML methods from theory theory is the strength of the source of the so	s, its principles car	nd practical
to a wide range of o	ner neds, microling equadation, medicine, and oriented engineering, in this outside, we will explore indication the method in the method in the second state of intersectives. Specifically, we will focus on cuttering edge models that are of intersect to both the research and commercial communications are set of the second state of intersectives.	inities	ind practical
	Porspectives: opecinically, we will locus on outling edge indeels that are on interest to both the research and commercial commu	77K	5
NIE-KOZ	Fattern Recognition	<u>∠,∠r</u> \	5
The aim of the m	odule is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the st	atistical annroach t	o nattern
The aim of the m recognition. Stu	odule is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the st dents will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, ar	atistical approach t	o pattern
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TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TVK1	Physical Education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
UKCJ7	Czech Language 7 for Ukrainian refugees	ZK	10
	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Tim	e, Family.	
UKCJP	Czech language for advanced	Z,ZK	2
A	n advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with val	idity for CTU.	
UKMAT	Mathematics UK	Z,ZK	5
UKR-PKM	Preparatory Mathematics for Ukrainian refugees	Z	5
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.			

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-07-09, time 09:37.