#### Study plan

#### Name of study plan: Bachelor branch Information Systems and Management, in Czech, 2015-2020

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Informatics, valid until 2024

Type of study: Bachelor full-time

Required credits: 153

Elective courses credits: 27 Sum of credits in the plan: 180

Note on the plan: Tato verze studijního plánu je ur ena pro ro níky, které byl p ijaty ke studiu od akademického

roku 2015/2016 do prezen ní formy studia bakalá ského programu.

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 116

The role of the block: PP

Code of the group: BI-PP.2015

Name of the group: Compulsory Courses of Bachelor Study Program Informatics, Presented in Czech, Version

2015

Requirement credits in the group: In this group you have to gain 116 credits

Requirement courses in the group: In this group you have to complete 20 courses

Credits in the group: 116

Povinný předmět BI-SI1 se studentům bez oboru nezapisuje automaticky. Zapíší si jej Note on the group:

	individuálně podle pokynů z katedry Softv	varového inž	enýrství.			
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-AG1	Algorithms and Graphs 1 Dušan Knop	Z,ZK	6	2P+2C	Z	PP
BI-AAG	Automata and Grammars  Jan Janoušek	Z,ZK	6	2P+2C	Z	PP
BI-BAP	Bachelor Thesis Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BI-BPR	Bachelor project  Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	2		Z,L	PP
BI-BEZ	Security Ji í Dostál	Z,ZK	6	2P+2C	L	PP
BI-CAO	Digital and Analog Circuits  Martin Kohlík	Z,ZK	5	2P+2C	Z	PP
BI-DBS	Database Systems Ji í Hunka	Z,ZK	6	2P+2R+1L	Z,L	PP
BI-DPR	Document., Presentation, Rhetorics Alena Libánská, Ond ej Guth, Petra Pavlí ková, Dana Vynikarová Ond ej Guth Dana Vynikarová (Gar.)	KZ	4	2P+2C	Z,L	PP
BI-LIN	Linear Algebra Daniel Dombek Daniel Dombek (Gar.)	Z,ZK	7	4P+2C	L	PP
BI-MLO	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+1C	Z	PP
BI-OSY	Operating Systems  Ladislav Vagner	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI	Computer Networks Jan Fesl	Z,ZK	5	2P+1R+1C	L	PP
BI-PST	Probability and Statistics Petr Novák	Z,ZK	5	2P+1R+1C	Z	PP
BI-PA1	Programming and Algorithmics 1 Ladislav Vagner	Z,ZK	6	2P+2R+2C	; Z	PP

BI-PA2	Programming and Algorithmics 2 Ladislav Vagner	Z,ZK	7	2P+1R+2C	L	PP
BI-PS1	Programming in Shell 1 Zden k Muziká	KZ	5	2P+2C	Z	PP
BI-SI1.2	Software Engineering I  Ji í Mlejnek, Zden k Rybola Zden k Rybola Ji í Mlejnek (Gar.)	Z,ZK	5	2P+1C	Z,L	PP
BI-SAP	Computer Structure and Architecture  Hana Kubátová	Z,ZK	6	2P+1R+2C	L	PP
BI-ZDM	Elements of Discrete Mathematics Ji ina Scholtzová, Jan Legerský Ji ina Scholtzová Josef Kolá (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-ZMA	Elements of Calculus Ivo Petr Ivo Petr Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP

	of the courses of this group of Study Plan: Code=BI-PP.2015 Name=Compulsory Courses of sented in Czech, Version 2015	of Bachelor Stud	dy Program
		7.71/	
BI-AG1	Algorithms and Graphs 1	Z,ZK	6
	e basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing		
	dge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating se also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic no		complexity of
BI-AAG		Z,ZK	6
	Automata and Grammars end to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of	1 '	_
	s, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, Relationships betwe	_	
1 0	through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translat		
BI-BAP	Bachelor Thesis	Z	14
BI-BPR	Bachelor project	Z	2
BI-BEZ	Security	Z,ZK	6
and hash functions. T	the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symm They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cr properly and securely cryptographic primitives and systems that are based on these primitives.	=	
BI-CAO	Digital and Analog Circuits	Z,ZK	5
Students get the fund	lamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models a	and principles of funct	ionality of
transistors, gates, cir-	cuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the difference	s between analog and	d digital modes
of electronic devices.			
BI-DBS	Database Systems	Z,ZK	6
Students are introduc	ed to the database engine architecture and typical user roles. They are briefly introduced to various database models. They l	earn to design small	databases
, , ,	nstraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience wit		
	ion - the relational database model. They learn the principles of normalizing a relational database schema. They understand the	•	
l ·	g parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introdu		_
	es with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of	database systems, de	ebugging and
	applications, distributed database systems, data stores.		
BI-DPR	Document., Presentation, Rhetorics	KZ	4
I	to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create a	and prepare interactive	e presentations
	e an audience. Students will also learn to write technical reports and scientific texts.		
BI-LIN	Linear Algebra	Z,ZK	7
-	in Czech. Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems		-
l - ·	are only linear. They know the basic methods for operating with matrices and linear spaces. They are able to perform matrix op	· ·	
	apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand the error-detecting a		
BI-MLO	Mathematical Logic	Z,ZK	5
The course seminary	-		
BI-OSY	Operating Systems	Z,ZK	5
	the classical theory of operating systems (OS) in addition to the knowledge gained in the module "Programming in Shell 1".		-
	nd threads implementations. They understand the problems of race conditions, thread scheduling, resource allocation and de		es of the
	al memory, principles and architectures of disks, RAID and file systems. They are able to design and implement simple multitle		
BI-PSI	Computer Networks	Z,ZK	5
	the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks. The		
1	e ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Studen	its will be able to write	e a simple
	nd configure a simple network.		
BI-PST	Probability and Statistics	Z,ZK	5
	In the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random va	-	
	om variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical in	•	•
	wn distributional parameters from random sample characteristics. They will also be introduced to the methods of determining	the statistical depend	lence of two or
more random variable			-
BI-PA1	Programming and Algorithmics 1	Z,ZK	6
_	lity to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple		-
	s, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for se	arching, sorting, and	manipulating
with linked lists.			
BI-PA2	Programming and Algorithmics 2	Z,ZK	7
	struments of object-oriented programming and are able to use them for specifying and implementing abstract data types (sta		' <del>=</del>
table). They can imple	ement linked structures. They learn these skills using the programming language C++. Although this is not a module of programm	ming in C++, students	are introduced

with all C++ features needed to achieve the main objective (operator overloading, templates).

BI-PS1 | Programming in Shell 1 | KZ | 5 | Students become knowledgeable users of common Unix-like operating systems. They understand the fundamental principles of the operating systems (file systems, processes and

threads, access rights, memory management, network interfaces). They gain the knowledge of advanced users, with hands-on experience of the shell, basic commands, and filters to process various text data.

BI-SI1.2 Software Engineering I

Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. They get practical skill thanks to applying hands-on analysis and design of a large-scale software project that is to be developed within the concurrent BI-SP1 module. They get skill to use CASE tools and UML for modelling and solving software-related problems. They get overview of object-oriented analysis, design, architecture, validation, verification, and testing processes.

BI-SAP Computer Structure and Architecture

Z,ZK

6

Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools. The subject teaches basic knowledge of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connections to higher programming languages.

BI-ZDM Elements of Discrete Mathematics

Z,ZK

5

Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, tools for solving recurrent equations, and basics of graph theory.

BI-ZMA Elements of Calculus

Z,ZK

7 7K

6

Students acquire knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and reasoning and are able to use basic proof techniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links between the integrals and sums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expressions.

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 25

Conceptual Modelling

The role of the block: PO

Code of the group: BI-PO-ISM.2015

Name of the group: Compulsory Courses of Bachelor Branch Information Systems and Management, in

Czech, Version 2015

Requirement credits in the group: In this group you have to gain 25 credits

Requirement courses in the group: In this group you have to complete at least 6 courses

Credits in the group: 25 Note on the group:

BI-KOM

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-KOM	Conceptual Modelling Marek Suchánek, Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	РО
BI-PAI	Law and Informatics  Zden k Ku era	ZK	3	2P	Z	РО
BI-PRP	Law and business Zden k Ku era, Martin Samek Martin Samek Zden k Ku era (Gar.)	Z,ZK	4	2P+1R	L	РО
BI-SI2.3	Software Engineering 2 Martin Hlavatý Zden k Rybola Martin Hlavatý (Gar.)	Z,ZK	3	2P	Z	РО
BI-TIS	Information Systems Design Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+1C	Z	РО
BI-ZNS	Knowledge-based Systems Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	Z	РО

# Characteristics of the courses of this group of Study Plan: Code=BI-PO-ISM.2015 Name=Compulsory Courses of Bachelor Branch Information Systems and Management, in Czech, Version 2015

DITION	Conceptual Modelling	_,,	0						
The course is focused of	The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to								
categorize and specify	correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological s	tructural modeling	in the OntoUML						
notation. Next, they lear	n how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data repre	sentation in the Int	ernet. They also						
learn the foundations of	enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEM	10 method and the	BPMN notation						
will be taught. The cour	will be taught. The course is designed with the respect to continuation in software implementations.								
BI-PAI	Law and Informatics	ZK	3						
This course is presente	d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).								
BI-PRP	Law and business	Z,ZK	4						
This course is presente	This course is presented in Czech.								
BI-SI2.3	Software Engineering 2	Z,ZK	3						
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).									

BI-TIS Information Systems Design

Students know various types of ISs and their practical implementation aspects and are able to match the needs of different market segments (customers) with applications of existing technologies (databases, programming languages, GUI etc.).

BI-ZNS Knowledge-based Systems

Z.ZK

į

Students will become familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intelligence to solve problems that require human judgment, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowledge-based systems to support decision-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutionary algorithms.

Name of the block: Povinné ekonomické Minimal number of credits of the block: 4

The role of the block: PE

Code of the group: BI-PP-EM.2015

Name of the group: Compulsory Economics and Management Bachelor Courses, in Czech, Version 2015

Requirement credits in the group: In this group you have to gain 4 credits

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

Credits in the group: 4

Note on the group:

Povinný předmět BI-EMP se studentům bez oboru nezapisuje automaticky. Zapíší si jej

individuálně podle pokynů z katedry Softwarového inženýrství.

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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
BI-EMP	Economics and Management Principles  David Buchtela, Petra Pavlí ková David Buchtela David Buchtela (Gar.)	KZ	4	2P+2C	Z,L	PE

## Characteristics of the courses of this group of Study Plan: Code=BI-PP-EM.2015 Name=Compulsory Economics and Management Bachelor Courses, in Czech, Version 2015

BI-EMP Economics and Management Principles

KZ

This course is aimed to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with fields: enterprise foundation, enterprise putting into state economic environment (CR), management of property and capital structure, business transaction records keeping during an accounting period, a relation between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.

Name of the block: Compulsory elective economic-management courses

Minimal number of credits of the block: 4

The role of the block: VE

Code of the group: BI-PVE-ISM.2015

Name of the group: Economical Courses of Bachelor Branch Information Systems and Management, in

Czech, version 2015

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 9)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 2)

Credits in the group: 4

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
FI-VEZ	economic-managerial course from a study abroad Miroslav Balík	Z	4	0+0	Z,L	VE
BI-FMU	Financial and Management Accounting David Buchtela David Buchtela (Gar.)	Z,ZK	5	2P+2C	Z	VE
BI-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	VE
BI-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	VE

## Characteristics of the courses of this group of Study Plan: Code=BI-PVE-ISM.2015 Name=Economical Courses of Bachelor Branch Information Systems and Management, in Czech, version 2015

FI-VEZ	economic-managerial course from a study abroad	<sub> </sub> Z	4					
A "Humanities subject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that is required in the curriculum.								
The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.								
RI_EMI I	Financial and Management Accounting	7 7K	5					

The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Intelligence moduls in Business information systems.

BI-FTR.1	Financial Markets	Z,ZK	5
This course is presented	d in Czech, However, there is an English variant in the program Informatics (B1801 / 4753)		

BI-SEP World Economy and Business

Z,ZK

4

This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by comparing individual 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 economic freedom, 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 individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA

Name of the group: English Language, Internal Certifica

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

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

Credits in the group: 2

Note on the group:

Ze skupiny je nutné absolvovat jeden ze dvou předmětů, představujících interní zkoušku z angličtiny. -- Předmět BI-ANG si zapisují studenti, kteří absolvovali přípravné kurzy z angličtiny a mají zápočet z předmětu BI-A2L. -- Předmět BI-ANG1 si zapisují studenti, kteří se na zkoušku připravovali samostatně. Tito studenti musí před vlastní zkouškou absolvovat zápočtovou písemku.

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

Characteristics of the courses of this group of Study Plan: Code=BI-ZKA Name=English Language, Internal Certifica

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2				
BIE-EEC English language external certificate							
The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding							
the B2 level of the Com	mon European Framework of Reference for Languages.						
BI-ANG	English Language, Internal Certificate	ZK	2				
Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG							

Name of the block: Povinná t lesná výchova, sportovní kurzy

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.2015

Name of the group: Compulsory Physical Education of Bachelor Program Informatics, in Czech, Version

2015

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses

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
TV1	Physical Education	Z	0	0+2	Z	PT
TVV	Physical education	Z	0	0+2	Z,L	PT
TVV0	Physical education	Z	0	0+2	Z,L	PT
TV2	Physical Education	Z	0	0+2	L	PT
TVKLV	Physical Education Course	Z	0	7dní	L	PT
TVKZV	Physical Education Course	Z	0	7dní	Z	PT

Characteristics of the courses of this group of Study Plan: Code=BI-PT.2015 Name=Compulsory Physical Education of Bachelor Program Informatics, in Czech, Version 2015

TV1	Ph	vsical Education	7	,	(	າ
1 7 1	' ''	y Sloar Education	_			, ,

TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

Name of the block: Compulsory elective humanities courses

Minimal number of credits of the block: 2

The role of the block: VH

Code of the group: BI-PV-HU.2015

Name of the group: Compulsory Elective Humanity Courses of Bachelor Study Program Informatics, in Czech,

Version 2015

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 6)

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

Credits in the group: 2

Note on the group:

Faculty guarantees the availability of these modules.

Note on the group	p. I doubly guaranteed the ave					
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
FI-FIL	Philosophy Peter Zamarovský Peter Zamarovský (Gar.)	ZK	2	2P	Z,L	VH
ВІ-НМІ	History of Mathematics and Informatics  Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	VH
FI-HTE	History of Technology and Economics  Jan Mikeš, Marcela Efmertová Jan Mikeš Jan Mikeš (Gar.)	ZK	2	2+0	Z,L	VH
FI-HPZ	Humanities subject from a study abroad  Miroslav Balík	Z	3	0+0	Z,L	VH
FI-MPL	Managerial Psychology  Jan Fiala	ZK	2	2+0	Z,L	VH
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	VH
FI-KSA	Cultural and Social Anthropology  Jakub Šenovský	ZK	2	2P	L,Z	VH
BI-KSA	Cultural and Social Anthropology Alena Libánská, Tomáš Houdek, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	VH
FI-ULI	Introduction to Linguistics for Computer Václav Cvr ek	ZK	2	2P	L	VH

Characteristics of the courses of this group of Study Plan: Code=BI-PV-HU.2015 Name=Compulsory Elective Humanity Courses of Bachelor Study Program Informatics in Czech Version 2015

FI-FIL	Philosophy	ZK	2
see A0B16		1	
BI-HMI	History of Mathematics and Informatics	Z,ZK	3
This course is pres	ented in Czech.		
FI-HTE	History of Technology and Economics	ZK	2
The course introdu	ces the scientific disciplines of history and technology, economic and social history of the Czech lands and Czechoslovakia in o	comparison with the	development o
the European region	on 19 to 21 century.		
FI-HPZ	Humanities subject from a study abroad	Z	3
A "Humanities sub	iect that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module	that is required in th	e curriculum.
The substitution is	approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.		
FI-MPL	Managerial Psychology	ZK	2
BI-EHD	Introduction to European Economic History	Z,ZK	3
This course is pres	ented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
FI-KSA	Cultural and Social Anthropology	ZK	2
The one-semester	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the di	versity of the world -	examples fron
anthropological res	earch from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language,	health, history, death	, etc) will b
shown. The course	is an interesting alternative to other humanities, taught at FIT.		
BI-KSA	Cultural and Social Anthropology	ZK	2
The one-semester	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the di	versity of the world -	examples fror
anthropological res	search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language,	health, history, death	, etc) will b
shown. The course	is presented in Czech.		
FI-ULI	Introduction to Linguistics for Computer	ZK	2
This course is pres	ented in Czech.	,	

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-PRO MG

Name of the group: Elective Courses, Suitable for those who intend to apply for Master's program at FIT

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

Courses in this group are recommended for students who intend to enroll to master

program at FIT.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-AG2	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V-PRO\_MG Name=Elective Courses, Suitable for those who intend to apply for Master's program at FIT

BI-AG2 Algorithms and Graphs 2 Z,ZK This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1. It further delives

into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.

Code of the group: BI-V.2017

Name of the group: Purely Elective Courses of Bachelor Programme BI, Version 2017

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Volitelné předměty, které nejsou povinnými v programu ani žádného oboru či Note on the group: zaměření

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ALO	Algebra and Logic Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era Lud k Ku era 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 (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V
NI-AFP	Applied Functional Programming Marek Suchánek, Robert Pergl, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-BLE	Blender 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
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining Tomáš Borovi ka	KZ	4	3C	L	V
BI-EP1	Effective programming 1  Martin Ka er Martin Ka er Martin Ka er (Gar.)	Z	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-EJA	Enterprise Java Ji í Dan ek <b>Ji í Dan ek</b> Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-FMU	Financial and Management Accounting David Buchtela David Buchtela David Buchtela (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Karel Hynek, Tomáš ejka Tomáš ejka (Gar.)	KZ	4	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský, Jan ezní ek Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	V

NI-IAM	Internet and Multimedia Ji í Melnikov	Z,ZK	4	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BI-CS2	C# language and data access Pavel St pán Pavel St pán Pavel St pán (Gar.)	KZ	4	0P+3C	Z	V
BI-CS3	Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	3C	Z	V
BI-SQL.1	Language SQL, advanced  Michal Valenta Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	V
BI-QAP	Quantum algorithms and programming Tomáš Kalvoda, Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	V
NI-LSM	Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.)	KZ	5	3C	L	V
NI-MPL	Managerial Psychology	ZK	2	2P	Z,L	V
NI-MSI	Jan Fiala Jan Fiala Jan Fiala (Gar.)  Mathematical Structures in Computer Science	Z,ZK	4	2P+1C	L	V
BI-MPP.21	Jan Starý Jan Starý (Gar.)  Methods of interfacing peripheral devices	Z,ZK	5	2P+2C	Z	V
BI-MIT	Miroslav Skrbek Miroslav Škrbek Miroslav Skrbek (Gar.)  Mikrotik technologies	KZ	3	1P+2C	Z	V
NI-MOP	Jan Fesl Jan Fesl Jan Fesl (Gar.)  Modern Object-Oriented Programming in Pharo	KZ	4	3C	Z	V
BI-MVT.21	Marek Skotnica, Jan Blizni enko Robert Pergl Robert Pergl (Gar.)  Modern Visualisation Technologies	Z,ZK	5	2P+2C	Z	V
BI-MMP	Ji Chludil, Petr Pauš Petr Pauš Petr Pauš (Gar.)  Multimedia team project	KZ		3C	_	-
	Zde ka echová Zde ka echová Zde ka echová (Gar.)  Linux Drivers		4		Z,L	V
NI-OLI	Jaroslav Borecký, Miroslav Skrbek Jaroslav Borecký Miroslav Skrbek (Gar.)  Programming Practices 1	Z,ZK	4	2P+2C	L	V
BI-ACM	Tomáš Valla, Ond ej Suchý <b>Tomáš Valla</b> 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 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	Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PJS.1	JavaScript Programming Old ich Malec	KZ	4	3C	L	V
BI-KOT	Programing in Kotlin Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
NI-PSL	Programming in Scala Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-PMA	Programming in Mathematica  Zden k Buk Zden k Buk Zden k Buk (Gar.)	Z,ZK	4	2P+2C	Z,L	V
BI-PHP.1	Programing in PHP	KZ	4	3C	Z	V
BI-PS2	Programming in shell 2 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
NI-PDD	Data Preprocessing  Marcel Ji ina Marcel Ji ina (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 Ji í Dostál, Josef Kokeš, Róbert Lórencz Josef Kokeš Ji í Dostál (Gar.)	Z,ZK	5	1P+2C	Z	V
BI-SCE1	Computer Engineering Seminar I  Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-SCE2	Computer Engineering Seminar II  Hana Kubátová Hana Kubátová 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	Z	3	3C	L	V
BI-ST3	Alexandru Moucha Álexandru Moucha (Gar.)  Network Technology 3  Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4	Alexandru Moucha Alexandru Moucha (Gar.)  Network Technology 4  Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	L	V

BI-SOJ	Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
BI-SVZ	Machine vision and image processing Lukáš Brchl, Marcel Ji ina, Jakub Novák Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	V
NI-SYP	Parsing and Compilers  Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
BI-GIT	Version control system GIT	KZ	2	16P	Z,L	V
TV1	Physical Education	Z	0	0+2	Z	V
TVV	Physical education	Z	0	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2	Physical Education	Z	0	0+2	L	V
TV2K1	Physical Education 2	Z	1		L,Z	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
BI-TS1	Theoretical Seminar I Dušan Knop, Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C	L	V
BI-TS3	Theoretical Seminar III Tomáš Valla, Ond ej Suchý, Ond ej Guth Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture  Marek Hakala	KZ	4	2P+1C	Z,L	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	3P	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-ULI	Introduction to Linux Zden k Muziká, Jan Ž árek, Dana ermáková, Petr Zemánek <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr Radek Richtr (Gar.)	ZK	4	2P+2C	Z	V
BI-VR1	Virtual reality I Petr Klán, Petr Pauš <b>Petr Klán</b> 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 Tomáš Valla Tomáš Valla (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability Jan Starý 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 (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-ZRS	Basics of System Control Kate ina Hyniová	Z,ZK	4	2P+2C	Z	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad  Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V.2017 Name=Purely Elective Courses of Bachelor Programme BI, Version 2017

BI-FMU	Financial and Management Accounting	Z,ZK	5
	s explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the		
	and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modific		
	based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of managoduls in Business information systems.	gement accounting	are base or
TV1	Physical Education	Z	0
TVV		Z	0
TVV0	Physical education	Z	0
	Physical Education	Z	
TV2	Physical Education		0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
BI-ALO	Algebra and Logic	Z,ZK	4
	d deepens the study of topics touched upon in the basic course in logic.	7.71/	4
BI-AVI.21	Algorithms visually ts other allowed about particular important algorithms from different fields of the compute	Z,ZK	4
	BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.o		· ·
	g the principles of algorithms easy.	rgan, mp.//www.an	goviolori.orgagi,)
BI-A2L	English language, preparation for the B2 level exam	Z	2
	se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme		
	age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both		
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.			
BI-APJ	Aplication Programming in Java	Z,ZK	4
This course is presente	d in Czech. Advanced technologies in Java.		
NI-AFP	Applied Functional Programming	KZ	5
	d in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function		
-	the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas	tering this paradio	ım becomes a
	of a software engineer: the theory and especially the practice.		
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
	I to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the clasent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori		
be presented as well.	and systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algori	unins and the neu	ai networks, wiii
BI-BLE	Blender	Z,ZK	4
	puledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those		
	mplete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphi		
NI-DSP	Database Systems in Practes	Z,ZK	4
This course is presente	·		
BI-STO	Storage and Filesystems	Z,ZK	4
The student will learn p	rinciples and current solutions of storage systems architecture. The module explains principles of data store, protection, and a	rchiving, as so as	storage scaling,
load balancing and high			
NI-DZO	Digital Image Processing	Z,ZK	4
'	comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical	J	•
	interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that i ing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDF		
	raction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray of	•	-
1 ' '	ossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, a		
NI-DDM	Distributed Data Mining	KZ	4
	e-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain han	1	
data processing framev	ork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation	ns and will be capa	able to propose
approaches to paralleliz	re other algorithms. The course is prezented in czech language.		
BI-EP1	Effective programming 1	Z	4
The course is taught in	Czech.		
BI-EP2	Efficient Programming 2	KZ	4
	t Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving inc	lividual problems a	are discussed,
	the best one and avoid implementation errors.		
BI-EJA	Enterprise Java	Z,ZK	4
	ced technologies in the Java programming language. The focus is on technologies for development of enterprise information	systems which ar	e connected to
BI-HAM	essed through the web interface.  HW accelerated network traffic monitoring	KZ	4
	students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring.		
	datory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as	_	=
	of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network to		
	ir practical abilities in this field.		
BI-ARD	Interactive applications on Arduino	KZ	4
	for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple app	lications for moder	n programmable
kits and control varied p			
	peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded	-	
not only on display of a Software Engineering s	PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefor	-	

NI-IAM	Internet and Multimedia	Z,ZK	4
	cused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes ac	-	
	ls (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic is. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the ε		
	f AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording		
for audience.		, <sub> </sub>	
BIE-IMA2	Introduction to Mathematics 2	Z	2
	lend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are	re able to apply the	em in particular
examples.			
BI-CS2	C# language and data access	KZ	4
	ata access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micr	•	
,	to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current ted	•	
	and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL ner objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data		
· ·	course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mo		-
(XML description).		,g	
BI-CS3	Language C# - design of web applications	KZ	4
	duced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overvie	ew of the developm	ent possibilities
on thisplatform. They wi	learn to create WebAPI and to use it by client programs.		
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based on know	vledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In	n particular stored	program unites,
00 /	s, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the pol	•	
	clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan		- 1
	es will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora	icle DBMS and pa	rtially on
PostgreSQL.	Overations also sittle as a send on a superior of	1/7	
BI-QAP	Quantum algorithms and programming	KZ	5
	udents hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic In showing advantages and limitations of quantum computing. During tutorials students work in open-source software develo		- 1
<del>-</del>	by by by by BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VIN	-	
	No previous knowledge of physics is assumed.	and oxponent	,
NI-LSM	Statistical Modelling Lab	KZ	5
	on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is	1	-
•	d its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms,	-	
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).		
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
Mathematical semantics	of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scot	t model of lambda	calculus.
Introduction to category	theory.		
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
	n methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University of the contract of the co	•	, l
	nd peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of U	JSB devices, Linux	and Windows
	on development, and APIs of selected devices.	1/7	
	Mikrotik technologies	KZ	3
	he subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are c providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the		
	and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute		
	data-link, network and transport layer of the OSI model.		
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented progran	ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, whe		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 s	kills of design and	implementation
	dern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development		
addition to deepening of	pject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo		:
		٠.	
technologies in terms of	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv	ement in the Phar	o Consortium.
technologies in terms of BI-MVT.21	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies	ement in the Phar	o Consortium.
technologies in terms of BI-MVT.21 The goal of the course i	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv  Modern Visualisation Technologies to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	zement in the Phar Z,ZK gmented reality, vi	o Consortium. 5 sualization on
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and aute.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mention	zement in the Phar Z,ZK gmented reality, vi	o Consortium. 5 sualization on
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays and procedural visualization.	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies sto give an overview of modern visualization technologies and their principles, namely technologies related to virtual and aude.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentition, scientific data visualization, and 3D model scanning.	Z,ZK gmented reality, vioned technologies	o Consortium.  5 sualization on s, namely fractal
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays and procedural visualiza BI-MMP	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and aude.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentition, scientific data visualization, and 3D model scanning.  Multimedia team project	zement in the Phar Z,ZK gmented reality, vi	5 sualization on
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays and procedural visualiza BI-MMP This course is presented	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies so to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and auditions. SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentition, scientific data visualization, and 3D model scanning.  Multimedia team project I in Czech.	Z,ZK Smented reality, vioned technologies	o Consortium. 5 sualization on s, namely fractal
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays and procedural visualiza BI-MMP This course is presented NI-OLI	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and audie.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentition, scientific data visualization, and 3D model scanning.  Multimedia team project I in Czech.  Linux Drivers	zement in the Phar Z,ZK Z,ZK gmented reality, vioned technologies KZ Z,ZK	o Consortium.  5 sualization on i, namely fractal  4
technologies in terms of BI-MVT.21 The goal of the course i high resolution displays and procedural visualiza BI-MMP This course is presented NI-OLI The Linux operating sys	semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv Modern Visualisation Technologies so to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and auditions. SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentition, scientific data visualization, and 3D model scanning.  Multimedia team project I in Czech.	ement in the Phar  Z,ZK gmented reality, vi oned technologies  KZ  Z,ZK g powerful process	o Consortium.  5 sualization on in namely fractal  4 ors and FPGAs
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BI-CS1	Programming in C#	KZ	4
_	s to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental		
	definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		•
well as work with files ar	properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggir	ng and exception	processing, as
BI-PJV	Programming in Java	Z,ZK	4
	In Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	۷,۷۱۲	7
BI-PJS.1	JavaScript Programming	KZ	4
	is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development	1	•
-	nts of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register fo	=	
of study.			
BI-KOT	Programing in Kotlin	Z,ZK	4
	cally-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advantage and the control of the co		
	va compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of	a modern, object	-functional way
<del></del>	plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).	7.71/	
NI-PSL	Programming in Scala  ne modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feature.	Z,ZK	4 matching and
	re modern programming ranguage ocala which exploits object functional paradigm, ocala comprises advance language lead s Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks a		- 1
Scalaz, etc.	. Social of about 10 about applications fathering but of the but o	and librarioo o.g. i	lay, Gaodanara,
BI-PMA	Programming in Mathematica	Z,ZK	4
1	with modern technical and scientific software. Students will learn how to use different programming styles (functional program		d programming,
etc.), how to create dyna	amic interactive applications and visualisations, data processing and presentations.		
BI-PHP.1	Programing in PHP	KZ	4
The course is taught in 0	Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a	nd will use tool th	nat eases
	e course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register f	or BIE-TWA.1. Th	ney should
	h their 3rd semester of study.		
BI-PS2	Programming in shell 2	Z,ZK	4
	overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add or particular scripting languages and will get practical experience with shell script programming.	lition, they gain a	deeper insignt
NI-PDD	Data Preprocessing	Z,ZK	5
1	e raw data for further processing and analysis. They learn what algorithms can be used to extract information from various dat		-
	arn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character		-
pages.		· ·	
BI-PKM	Introduction to mathematics	Z	4
This course is presented	l in Czech.		
NI-REV	Reverse Engineering	Z,ZK	5
	nted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens b		
	nderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is ded		
• •	++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de ng work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compute		,,,
	ninars, where students will solve practically oriented tasks from the real world.	i maiware seeme	1110 10003 01
	Computer Engineering Seminar I	Z	4
	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance		
are approached individu	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	ne subject is work	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 teach	hers. The topics a	are new for each
semester.			
BI-SCE2	Computer Engineering Seminar II	Z	4
•	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance		
• • • • • • • • • • • • • • • • • • • •	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the sional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach	•	
semester.	olonial monatare and/or from the female of the continue to continue to the continue to the continue to	nord. The topics t	are new ior eden
	Network Technology 1	Z	3
-	o providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredite	1	
CCNA1 - R&S Intro	duction to Networks.		
BI-ST2	Network Technology 2	Z	3
This course is presented	f in Czech.		
BI-ST3	Network Technology 3	Z	3
	ance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during	-	
=	he course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, prec	lictability, extension	on beyond a
simple topology, security BI-ST4		Z	3
	Network Technology 4   lance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switchin	_	
	ner extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency.		-
<del>-</del>	y, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely		-
· · · · · · · · · · · · · · · · · · ·	ss) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch	-	-
<del>-</del>	ncy procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation	ition ways while r	naintaining the
network running.			
	Machine Oriented Languages	Z,ZK	4
	rill gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal In of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view	· · · · · · · · · · · · · · · · · · ·	
	i of software with hardware. Next, there will be discussed xoo specifics of the majority of OSes from the application point of view ised during reverse engineering, optimization, and evaluation of code security.	mineu willighel	icvei iai iguages.
	J J , , , , , , , , , , , , , , , , , ,		

BI-SVZ	Machine vision and image processing	Z,ZK	5
Camera systems are be	coming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate	e image information	on. The course
	ifferent types of camera systems and a variety of methods for image and video processing. The course is focused on practical	use of camera sys	stems for solving
	t the graduates may encounter.		
NI-SYP	Parsing and Compilers	Z,ZK	5
	the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge o troduced to special applications of parsers, such as incremental and parallel parsing.	or various variants	and applications
BI-GIT	Version control system GIT	KZ	2
	ced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pro-		
	n details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server		
TV2K1	Physical Education 2	Z	1
BI-TS1	Theoretical Seminar I	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	ا 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 scien	ntific papers and
other scholarly literature	e. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS2	Theoretical Seminar II	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		•
	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 limited by the the potentials of the teachers of the seminar.	- 1	
BI-TS3	Theoretical Seminar III	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	0.0	
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is s. The capacity is limited by the the potentials of the teachers of the seminar.	s a work with sciei	nuic papers and
BI-TS4	Theoretical Seminar IV	Z	4
	tended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class	_	•
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is	0.0	
	e. The capacity is limited by the the potentials of the teachers of the seminar.		paporo ana
BI-TDA	Test driven architecture	KZ	4
	n practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a	ı	the DevOps
	a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur i		
NI-TSP	Testing 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	, ,	with the help of
the intuitive path sensiti	zation and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with	built-in-self-test e	quipment. They
will be able to compute,	analyze, and control the reliability and availability of the designed circuits.		
BI-CCN	Compiler Construction	Z,ZK	5
This is an introductory of	lass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	s of compilers for	students to
understand the design a	and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme	of the class.	
BI-TEX	TeX and Typography	Z,ZK	4
This course is presented	TeX and Typography I in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of t	· .	•
This course is presenterules.	d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of t	he course focuses	s on typographic
This course is presented rules.  BI-ULI	d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to Linux	he course focuses	s on typographic
This course is presente rules.  BI-ULI Students become famili	d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become	he course focuses	s on typographic
This course is presenterules.  BI-ULI Students become familiand techniques of a Uni	Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).	he course focuses  Z e familiar with bas	s on typographic  2 sic commands
This course is presented rules.  BI-ULI Students become familiand techniques of a Uni BI-OPT	Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks	he course focuses  Z e familiar with base  Z,ZK	s on typographic  2 sic commands
This course is presented rules.  BI-ULI Students become familiand techniques of a Uni BI-OPT Students get basic over	Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on p	the course focuses  Z e familiar with base  Z,ZK ossible problems	s on typographic  2 sic commands  4 with deployment
This course is presented rules.  BI-ULI Students become familiand techniques of a Uni BI-OPT Students get basic over of optical network techniques.	Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and becom x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on pology and on their solutions. The course will include the history of optical communications, an overview of passive componer	the course focuses  Z e familiar with base  Z,ZK cossible problems ats (optical fibres,	s on typographic  2 sic commands  4 with deployment multiplexors,
This course is presented rules.  BI-ULI Students become familiand techniques of a Uni BI-OPT Students get basic over of optical network techniques of compensator	Introduction to Linux are with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on prology and on their solutions. The course will include the history of optical communications, an overview of passive components, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems.	e familiar with base Z,ZK ossible problems ats (optical fibres, stems). The course	s on typographic  2 sic commands  4 with deployment multiplexors, e will also cover
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This course is presented rules.  BI-ULI Students become familiand techniques of a Uni BI-OPT Students get basic over of optical network techniques of a Universion compensato the most up-to-date top	Introduction to Linux are with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on prology and on their solutions. The course will include the history of optical communications, an overview of passive components, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems.	e familiar with base Z,ZK ossible problems at (optical fibres, stems). The course as the accurate to	s on typographic  2 sic commands  4 with deployment multiplexors, e will also cover ime on Internet,
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This course is presenterules.  BI-ULI Students become familiand techniques of a Uni BI-OPT Students get basic over of optical network technidispersion compensator the most up-to-date top ultrastable frequency trafform practice.  NI-VCC Students will gain know acquainted with virtualize performance parameter management of compleand development tools.  BI-VHS The course leads studer complemented by the transpersion to Virtual R The course focuses on and shared social activities.  BI-VR2 Continuation of the cour for computer science ar BI-VAK.21 The course aims to intraissue from applications	Introduction to Linux are with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks wiew of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on pology and on their solutions. The course will include the history of optical communications, an overview of passive components, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such insfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters  Virtualization and Cloud Computing edge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and aution principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to effits of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect or computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skill Continuous integration and development).  Virtual game worlds tis to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current is every of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world, the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.  Virtual reality I  se Virtual reality I  se Virtual reality I. The new course focuses on collaborative telepresence, spatial computing and so	e familiar with base  Z,ZK ossible problems hts (optical fibres, stems). The course as the accurate to a second se	s on typographic  2 sic commands  4 with deployment multiplexors, e will also cover ime on Internet, live real tasks  5 hey will get ad optimize the day for the odern integration  4 ge is furthermore be followed by  4 communication. sing, empathy  3 elop applications  3 we approach the est. Furthermore,
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This course is presenterules.  BI-ULI Students become familiand techniques of a Unital BI-OPT Students get basic over of optical network technidispersion compensator the most up-to-date top ultrastable frequency trafform practice.  NI-VCC Students will gain know acquainted with virtualize performance parameter management of compleand development tools.  BI-VHS The course leads studer complemented by the the course MI-PVR with BI-VR1 Introduction to Virtual R The course focuses on and shared social activities.  BI-VR2 Continuation of the cour for computer science ar BI-VAK.21 The course aims to introissue from applications with the active participal will select problems to be	Introduction to Linux are with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).  Introduction to Optical Networks  view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on pology and on their solutions. The course will include the history of optical communications, an overview of passive components, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such insfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters.  Virtualization and Cloud Computing edge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and ration principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to effice of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skit Continuous integration and development).  Virtual game worlds ts to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current secony of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.  Virtual reality II  selected Applications of Combinatorics duce students in an accessible form to various branches of theoretical computer scienc	e familiar with base  Z,ZK ossible problems hts (optical fibres, stems). The course as the accurate to a students will so  Z,ZK d organizations. To ciently operate are ive technology to could be a students knowledge. The course can be course in the course of the course can be course. A course can be course. A course can be course. A course can be course. A course can be course. A course can be course. A course can be course.	s on typographic  2 sic commands  4 with deployment multiplexors, e will also cover ime on Internet, live real tasks  5 hey will get ad optimize the day for the odern integration  4 ge is furthermore be followed by  4 communication. sing, empathy  3 elop applications  3 we approach the est. Furthermore, from which we

BI-VMM	Selected Mathematical Methods	Z,ZK	4
We start reviewing geor	netric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and	d its fast implemen	ntation (FFT).
Further we deal with dif	ferential calculus of functions involving multiple variables. We present methods for the localization of extreme values of function	ons. For this purpo	oses, we study
normed linear spaces a	nd quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization ar	d duality. The line	ar programming
and the Simplex method	d is analyzed in more detail.		
NI-VYC	Computability	Z,ZK	4
Classical theory of recu	rsive functions and effective computability.		
BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or i		
	he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess		
•	rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits		
	gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	•	
exceeds the academic	·		
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or i	I	-
	he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess		
•	rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits		
	gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	•	
exceeds the academic	•		
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
	within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or i	į.	
	he FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profess		
•	rses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits		
	gn institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided	•	
exceeds the academic	·	,	·
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
_	rstem fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim		teach students
,	control and development of applications in a graphical development environment. Lectures provide fundamentals of motion of		
	tion and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to ge		- ''
technologies.	······································	.,	
BI-ZPI	Process engineering	KZ	4
	amentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of		ing and they will
	I notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of b	•	, ,
CASE tools. The role of	process engineering for information systems development is discussed as well as its importance in the overall context of info	rmation and busir	ness strategy of
an enterprise.			0,
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain the ba	lasics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech	popular framewo	rk. The resulting
knowledge should serve	e for the efficient creation of a web backend in PHP language.		
BI-ZRS	Basics of System Control	Z.ZK	4
	roduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will foc	, ,	articularly on
-	nd physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, descripti	· · · · · · · · · · · · · · · · · · ·	
	stems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of cr	-	
	dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also give		, i
	stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industr		
and digital controllers a		•	

BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presente	d in Czech.		
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presente	d in Czech.		
BI-3DT.1	3D Printing	KZ	4

Code of the group: BI-ISM-VO.2017

Name of the group: Elective Vocational Courses for a Bachelor Branch BI-WSI, Version 2017

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

Všechny povinné předměty oborů a zaměření s výjimkou tohoto oboru

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-ADU.1	Unix Administration  Zden k Muziká	Z,ZK	5	2P+2C	L	V
BI-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-AG2	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	V
BI-APS.1	Architectures of Computer Systems Pavel Tvrdík	Z,ZK	5	2P+2C	Z	V

BI-BEK	Secure Code Róbert Lórencz	Z,ZK	5	2P+2C	L	V
BI-BIG	DB Technologies for Big Data Josef Gattermayer, Jan Matoušek, Monika Borkovcová Jan Matoušek Monika Borkovcová (Gar.)	KZ	4	2P+2C	Z	V
BI-HWB	Hardware Security Ji í Bu ek, Filip Kodýtek, Róbert Lórencz <b>Ji í Bu ek</b> Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	٧
BI-JPO	Computer Units Alois Pluhá ek	Z,ZK	5	2P+2C	Z	٧
BI-MGA	Multimedia and Graphics Applications Ji í Chludil	Z,ZK	5	2P+2C	Z	V
BI-OOP	Object-Oriented Programming Filip K ikava Filip K ikava Filip K ikava (Gar.)	Z,ZK	4	2P+2C	Z	V
BI-PGR.1	Computer graphics programming	Z,ZK	5	2P+2C	L	V
BI-PNO	Practical Digital Design Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	٧
BI-PJP	Programming Languages and Compilers  Jan Janoušek	Z,ZK	5	2P+1C	L	V
BI-PPA	Programming Paradigms  Jan Janoušek	Z,ZK	5	2P+2R	Z	V
BI-PGA	Programming of graphic applications Radek Richtr, Ji í Chludil Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-PYT	Python Programming	Z,ZK	4	2P+2C	L	V
BI-SP1.21	Team Software Project 1 Radek Richtr, Marek Suchánek, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	٧
BI-SP1	Team Software Project 1 Ji í Mlejnek	KZ	4	2C	L	V
BI-SP2.1	<b>Team Software Project 2</b> Marek Suchánek, Ji í Chludil, Robert Pergl, Marek Skotnica, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský <b>Ji í Mlejnek</b> Ji í Mlejnek (Gar.)	KZ	4	2C	Z	V
BI-SP2	Team Software Project 2  Ji í Mlejnek	KZ	6	2C	Z	V
BI-SSB	System and Network Security Ji í Dostál Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-SRC	Real-time systems Jaroslav Borecký, Hana Kubátová Jaroslav Borecký Hana Kubátová (Gar.)	KZ	4	2P+2C	Z	V
BI-TJV	Java Technology Ond ej Guth	Z,ZK	4	2P+2C	Z	V
BI-XML	XML Technology  Jan Mokrý	Z,ZK	4	2P+2C	L,Z	V
BI-TUR	User Interface Design Jan Schmidt	Z,ZK	4	2P+2C	L	V
BI-TWA.1	Web Application Design Filip Glazar, David Bernhauer Filip Glazar David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-VES	Embedded Systems Miroslav Skrbek	Z,ZK	5	2P+2C	L	V
BI-VWM	Searching the Web and Multimedia Databases Tomáš Skopal	Z,ZK	5	2P+1C	L	V
BI-VZD	Data Mining Alexander Kovalenko, Karel Klouda, Ond ej Tichý, Daniel Vašata Daniel Vašata Pavel Kordík (Gar.)	Z,ZK	4	2P+2C	L,Z	V
BI-ZRS	Basics of System Control  Kate ina Hyniová	Z,ZK	4	2P+2C	Z	V
BI-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	V

## Characteristics of the courses of this group of Study Plan: Code=BI-ISM-VO.2017 Name=Elective Vocational Courses for a Bachelor Branch BI-WSI, Version 2017

BI-AG2

Algorithms and Graphs 2

This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory course BI-AG1. It further delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.

BI-ZRS Basics of System Control Z,ZK 4

The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models,

control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control.

BI-ADU.1 Unix Administration Z,ZK 5

Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They will understand the differences between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, file systems, disk subsystems, processes, memory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the knowledge from the lectures on specific examples from practice.

!	Z,ZK	4
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	7.71/	
BI-APS.1   Architectures of Computer Systems   students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instruction	Z,ZK	5 given on the
pelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and		•
ot only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness	ess of the sequential mo	del of program
he course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe		
II-BEK   Secure Code	Z,ZK	5
he students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After neory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not		
dministrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of si		
ecurity and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks an	-	
II-BIG DB Technologies for Big Data	KZ	4
his course is presented in Czech.		
I-HWB Hardware Security	Z,ZK	5
he course deals with hardware resources used to ensure security of computer systems including embedded ones. The students become fam ryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledg		-
cluding side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless sma		
nd related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.		9
I-JPO Computer Units	Z,ZK	5
tudents deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in	n detail with the internal	structure and
rganization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using	•	
f multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail		
orrection for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles ne environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educationa		
nd programmable hardware design kits (FPGA).	ir microprogrammed pro	ocosor simula
I-MGA Multimedia and Graphics Applications	Z.ZK	5
tudents get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools	. , ,	_
aphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduct	tion to graphic formats, a	and compressi
chnologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understa		ration and use
graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D mode		
I-OOP   Object-Oriented Programming bject-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate t	Z,ZK	4
bject-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate to burse we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for softwar		-
anding, refactoring and design patterns.	o dovolopinom moladin	g 100m/g, 0.10
BI-PGR.1 Computer graphics programming	Z,ZK	5
students are able to program a simple interactive 3D graphical application like a computer game or scientific visualisation, to design the scene,	add textures imitating of	eometric deta
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	sed in computer graphic	cs, such as
raphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics, and representing	sed in computer graphic solid fundamentals for y	cs, such as our profession
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BI-SP2 Team Software Project 2 Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BEI-SP1 course project. However, this time, the functionality, testing and documenting of the system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) with regard to the formal as well as material aspects of their solution. The BEI-SI2 course that runs concurrently will provide the students with supporting knowledge, especially in the area of teamwork, testing and quality assurance of the software product. **BI-SSB** Z,ZK 5 System and Network Security This course is focused on selected areas of computer networks and computer systems in terms of cyber security **BI-SRC** ΚZ 4 Real-time systems Students obtain the basic knowledge in the Real-time theory and in the design methods for RT systems including the dependability issues. Thereticia knowledges from lectures will be experimentally verified on the practical labs of the Department of Digital Design. This subject is mainly based on embedded R-T systems, therefore the used design kits are the same as in BI-VES subject and FPGA **BI-TJV** Java Technology 7.7K The subject goal is to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programming. This subject presents how to build the three and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb services, JNDI etc.). At the course end is student able to create three layers enterprise application. XML Technology Students learn to make and validate XML documents (XML Schema, Relax, Schematron) and learn standard methods of their processing (SAX, DOM). An emphasis will be given to language XPath which enables addressing of parts of XML documents and its usage in different XML technologies. Students will also learn basics of XSLT programming. XSLT and XPath programming will be based on version 2.0. Students will gain a broad overview of XML technologies. User Interface Design Students have a basic overview of the methods for designing and testing common user interfaces. They have experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of the methods that bring users into the development process to ensure optimal communication with a user. Web Application Design The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV\* framework AngularJS. **Embedded Systems** Z.ZK Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. BI-VWM Searching the Web and Multimedia Databases  $Z,\overline{ZK}$ Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). BI-VZD Data Mining Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering). Artificial Intelligence Fundamentals Z.ZK Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will

be presented as well.

#### List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A2L	English language, preparation for the B2 level exam	Z	2
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 I	anguage instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the	e midterm and the	final term
tests with the succe	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi	vidual teachers du	ring the first
1	class of the term.		
BI-AAG	Automata and Grammars	Z,ZK	6
Students are introd	uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	automata, regular	expressions
and regular gramma	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, Relationships between fo	rmal languages an	d automata.
Knowledge acquir	ed through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,	and design of digit	al circuits.
BI-ACM	Programming Practices 1	KZ	5
'	This course is presented in Czech.	'	
BI-ACM2	Programming Practices 2	KZ	5
'	This course is presented in Czech.	'	
BI-ACM3	Programming Practices 3	KZ	5
	This course is presented in Czech.	'	

BI-ACM4	Programming Practices 4	KZ	5
DI ADII 4	This course is presented in Czech.	7.71/	_
BI-ADU.1	Unix Administration	Z,ZK	5
	the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,		
	ory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known specific examples from practice.	-	-
BI-ADW.1	Windows Administration	Z,ZK	4
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	,	
BI-AG1	Algorithms and Graphs 1	Z,ZK	6
	ers the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cur		
	wledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the prithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asym	•	mplexity of
BI-AG2	Algorithms and Graphs 2	Z,ZK	5
	nted in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory c		_
into advances data	structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version	on of the course se	e BIE-AG2.
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AND.21	Programming for the Android Operating System  This course is presented in Czech.	KZ	4
BI-ANG	English Language, Internal Certificate  Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN	ZK G	2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-APJ	Aplication Programming in Java	Z,ZK	4
	This course is presented in Czech. Advanced technologies in Java.	,	l
BI-APS.1	Architectures of Computer Systems	Z,ZK	5
	rn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec		
1 ' '	in processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the princ rocessors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the	•	
	elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and	•	
BI-ARD	Interactive applications on Arduino	KZ	4
The subject is desi	gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat	ions for modern pro	ogrammable
	aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s	•	
not only on displ	ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore	is suitable even for	Web and
BI-AVI.21	Software Engineering students.  Algorithms visually	Z,ZK	4
	ements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer sc	,	
knowledge present	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&l	t;http://www.algovis	sion.org>)
	that make understanding the principles of algorithms easy.		
BI-BAP	Bachelor Thesis	Z	14
BI-BEK	Secure Code earn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa	Z,ZK	5
	s gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		_
•	rileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing		
security and	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the		them.
BI-BEZ	Security	Z,ZK	6
	nd the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric a s. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptos		
and nasir functions	They are able to use properly and securely cryptographic primitives and systems that are based on these primitives.	ysterns for comput	ei systeilis.
BI-BIG	DB Technologies for Big Data	KZ	4
	This course is presented in Czech.		ļ.
BI-BLE	Blender	Z,ZK	4
	ads knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those in	_	-
	offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph		
BI-BPR	Bachelor project	Z Z,ZK	2
BI-CAO Students get the	Digital and Analog Circuits e fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and		5 onality of
_	circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences betw		-
	of electronic devices.		
BI-CCN	Compiler Construction	Z,ZK	5
	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	· ·	
BI-CS1	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching  Programming in C#	KZ	s. 4
	urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co		
_	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		
constructors, meth	nods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging	and exception pro	cessing, as
BL OCC	well as work with files are emphasized.	177	4
BI-CS2	C# language and data access and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micros	KZ	4 tudents will
"	ts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technic	•	
	erying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (L	-	

(Orani). Triis part 0	f the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model. (XML description).	, Storage Model ar	nd Mapping
BI-CS3	Language C# - design of web applications	KZ	4
	e introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of	of the development	possibilities
	on thisplatform. They will learn to create WebAPI and to use it by client programs.		
BI-DBS	Database Systems	Z,ZK	6
	oduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the	_	
	lation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundar		
	lling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to		-
in relational databa	ases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of datab	pase systems, deb	ugging and
BI-DPR	optimizing database applications, distributed database systems, data stores.  Document., Presentation, Rhetorics	KZ	4
	ed to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and professional communication and writing of the scientific texts (bachelor's and diploma thesis).		_
,	and presenting before an audience. Students will also learn to write technical reports and scientific texts.	.,	
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-EJA	Enterprise Java	Z,ZK	4
The course is on a	advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sys a database and are accessed through the web interface.	stems which are co	onnected to
BI-EMP	Economics and Management Principles	KZ	4
	ned to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with		-
enterprise putting i	nto state economic environment (CR), management of property and capital structure, business transaction records keeping during ar	n accounting period	d, a relation
	between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.		
BI-EP1	Effective programming 1  The course is taught in Czech.	Z	4
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Ef	fficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individ	dual problems are	discussed,
	with the aim to choose the best one and avoid implementation errors.		
BI-FMU	Financial and Management Accounting	Z,ZK	5
	rse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the par unts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification	_	-
-	rations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manager	· -	=
	Business Inteligence moduls in Business information systems.	<b>3</b>	
BI-FTR.1	Financial Markets	Z,ZK	5
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-GIT	Version control system GIT	KZ	2
	troduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practi		-
even the i	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s	server administrato	rs.
even the in	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s  HW accelerated network traffic monitoring	server administrato	ors.
even the in BI-HAM This course introduced in the second in	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s	server administrato  KZ e monitoring and a	4 analysis of
BI-HAM This course introduction network traffic are	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s  HW accelerated network traffic monitoring duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a si loals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic	KZ e monitoring and a ource of informatio	4 analysis of on and data
even the in BI-HAM This course introduce network traffic are for analysis). The g	mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git s  HW accelerated network traffic monitoring duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a se loals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic  level and to develop their practical abilities in this field.	EVER ADMINISTRATO  KZ  e monitoring and a cource of information con a hardware and a contact of the contact of	analysis of on and data and software
BI-HAM This course introduction network traffic are	HW accelerated network traffic monitoring duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a second of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic level and to develop their practical abilities in this field.  History of Mathematics and Informatics	KZ e monitoring and a ource of informatio	4 analysis of on and data
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even the in BI-HAM This course introduction network traffic are for analysis). The gradient of the second of the second of multiplication. The course deapen organization of condition of the environment and the environment and BI-KOM The course is focut categorize and spenotation. Next, they learn the foundation.  BI-KOT Kotlin is a modern	HW accelerated network traffic monitoring  duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a second of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic level and to develop their practical abilities in this field.  History of Mathematics and Informatics  This course is presented in Czech.  Hardware Security  swith hardware resources used to ensure security of computer systems including embedded ones. The students become familiar with ules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about v. unel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card tect and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of Fundamentals of iOS Application Development for iPhone and iPad  This course is presented in Czech.  Computer Units  their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail we neutral units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using approprie organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including let and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including let and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles	erver administrator KZ er monitoring and a cource of information of the control o	analysis of on and data and software  3  5 nciples of / resources, applications  4  5 ucture and elementation and elementation and coessor with or simulator  5 ne ability to be OntoUML at. They also MN notation  4  structions.

BI-KSA	Cultural and Social Anthropology	ZK	2
	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization,, material culture, language, health	•	
antinopological res	shown. The course is presented in Czech.	i, mstory, death, e	.c) Will be
BI-LIN	Linear Algebra	Z,ZK	7
The course is taugh	ht in Czech. Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems around	d us, where the de	pendencies
	s are only linear. They know the basic methods for operating with matrices and linear spaces. They are able to perform matrix operation	· · · · · · · · · · · · · · · · · · ·	
	ey can apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand the error-detecting ar		
BI-MGA	Multimedia and Graphics Applications	Z,ZK	5
	uainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for work ation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to grap		
	y learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the p		-
	of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating		J
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 com	nmonly used by the	small and
middle internet ser	vice providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the me	etallic, optical or w	ireless links
and how to adminis	trate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer ne	etworks concepts li	ke protocols
DI 1411 O	and technologies of the data-link, network and transport layer of the OSI model.	7 714	
BI-MLO	Mathematical Logic	Z,ZK	5
DLMMD	The course seminary is taught in Czech.	1/7	4
BI-MMP	Multimedia team project This course is presented in Czech.	KZ	4
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
	sed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa		-
	side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE		<b> </b>
	drivers, simple application development, and APIs of selected devices.		
BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5
	urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augm		
high resolution disp	olays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentione	ed technologies, na	mely fractal
DI OOD	and procedural visualization, scientific data visualization, and 3D model scanning.	7.71/	
BI-OOP	Object-Oriented Programming programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	Z,ZK	4 In this
	some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software develop		- 1
ocured no lock at	handing, refactoring and design patterns.	princing including to	og, oo.
BI-OPT	Introduction to Optical Networks	Z,ZK	4
Students get basic	overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possi		deployment
	technology and on their solutions. The course will include the history of optical communications, an overview of passive components		
	sators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system	,	
· ·	e topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as incy transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. S		
diffuolable freque	from practice.	otadonio wiii doivo	Tour tuono
BI-OSY	Operating Systems	Z,ZK	5
	and the classical theory of operating systems (OS) in addition to the knowledge gained in the module "Programming in Shell 1". They	,	
kernels, process	ses and threads implementations. They understand the problems of race conditions, thread scheduling, resource allocation and deadl	locks, the techniqu	es of the
	nt of virtual memory, principles and architectures of disks, RAID and file systems. They are able to design and implement simple mult		ons.
BI-PA1	Programming and Algorithmics 1	Z,ZK	6
_	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, struc		
statements, function	ons, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searchii with linked lists.	ng, sorting, and m	anipulating
BI-PA2	Programming and Algorithmics 2	Z,ZK	7
	e instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, q		
	plement linked structures. They learn these skills using the programming language C++. Although this is not a module of programming in	_	- 1
	with all C++ features needed to achieve the main objective (operator overloading, templates).		
BI-PAI	Law and Informatics	ZK	3
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-PGA	Programming of graphic applications	Z,ZK	5
	This course is presented in Czech only.		_
BI-PGR.1	Computer graphics programming	Z,ZK	5
	o program a simple interactive 3D graphical application like a computer game or scientific visualisation, to design the scene, add textu ke wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in a		
	geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics, and representing solid func		
	for GPU programming and animations. They get used to techniques utilised in geometric modelling, modelling of curves and surfaces		
BI-PHP.1	Programing in PHP	KZ	4
The course is ta	aught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a	and will use tool th	at eases
development in	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for	or BIE-TWA.1. The	y should
	register for this course in their 3rd semester of study.		
BI-PJP	Programming Languages and Compilers	Z,ZK	5
	asic methods of implementation of common high-level programming languages. They get experience with the design and implementati Amming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has		
	amining language, data types, subrodulines, and data abstractions. Students are able to formally specify a translation of a text that has empiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but	· ·	- 1
	for parsing and processing text in a language defined by a LL(1) grammar.		F. 29.31113

	JavaScript Programming	KZ	4
	course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development		e course is
	students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for the		
	of study.		
BI-PJV	Programming in Java  This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-PKM	Introduction to mathematics	Z	4
DI-I KW	This course is presented in Czech.	_	1 -
BI-PMA	Programming in Mathematica	Z,ZK	4
tudents will be we	orking with modern technical and scientific software. Students will learn how to use different programming styles (functional programm	ing, rule-based p	orogrammin
DI DNO	etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	1/7	
BI-PNO	Practical Digital Design  verview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the l	KZ	5
_	ion technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the module project sing modern, in tools.		
BI-PPA	Programming Paradigms	Z,ZK	5
The course deals	s with basic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of partic	ular approaches.	. Functiona
	digm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. Thus and on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainstrated on such as C++ and Java.		
BI-PRP	Law and business	Z,ZK	4
	This course is presented in Czech.	· 	· · · · · · · · · · · · · · · · · · ·
BI-PS1	Programming in Shell 1	KZ	5
	e knowledgeable users of common Unix-like operating systems. They understand the fundamental principles of the operating systems phts, memory management, network interfaces). They gain the knowledge of advanced users, with hands-on experience of the shell, be process various text data.		
BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a g	eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition	on, they gain a de	eeper insig
DI BOI	into shell and some other particular scripting languages and will get practical experience with shell script programming.	7.71	
BI-PSI	Computer Networks  Indicate the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks. The topic	Z,ZK	5
	of the ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Students we network application and configure a simple network.		
BI-PST	Probability and Statistics	Z,ZK	5
	earn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variable	•	1
	andom variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-	
	noun variable distributions and solve applied probabilistic problems in mormatics and computer science. Osing the statistical induction nown distributional parameters from random sample characteristics. They will also be introduced to the methods of determining the statistical induction.	=	-
ournations of arm	more random variables.	anonoai dopoilao	
BI-PYT	Python Programming	Z,ZK	4
	T		
	The course is taught in Czech.	· 	· ·
BI-QAP	Quantum algorithms and programming	KZ	5
course aims at giv	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or	n which quantum	5 technologi
Course aims at giv are based, and al	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development.	n which quantum nent kit Qiskit, wh	5 technologi
Course aims at giv are based, and al	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm 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	n which quantum nent kit Qiskit, wh	5 technologi
Course aims at giv are based, and alo on Python langua	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm rige. 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.	n which quantum nent kit Qiskit, wh and experience	5 technological is base
Course aims at giv are based, and alg on Python langua	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm age. 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.  Computer Structure and Architecture	n which quantum nent kit Qiskit, wh and experience Z,ZK	5 technological is base with Pythol
Course aims at giv are based, and alg on Python langua BI-SAP Students understa transfer. In the lab	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm age. 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inpu as, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design	n which quantum nent kit Qiskit, wh and experience Z,ZK ts, outputs, data gn tools. The sub	5 technologi nich is base with Pytho 6 storage an ject teache
Course aims at giv are based, and alg on Python langua BI-SAP Students understa transfer. In the lab	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm age. 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inpu so, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design are of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection	n which quantum nent kit Qiskit, wh and experience Z,ZK ts, outputs, data gn tools. The sub	5 technological final fi
Course aims at giv are based, and alg on Python langua BI-SAP Students understa transfer. In the lab basic knowledge	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. Received 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputed as the level of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.	n which quantum nent kit Qiskit, wh and experience Z,ZK ts, outputs, data gn tools. The sub ons to higher pro	5 technologichich is base with Pythologich external from the storage and stora
Course aims at giv are based, and alg on Python langua BI-SAP Students understa transfer. In the lab basic knowledge BI-SCE1	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. No previous students work in open-source software developming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. We focus on fundaments of BI-MA2 or BI-VMM might be an advantage. No previous knowledge of physics is assumed.  Computer Structure and Architecture and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputes, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I	n which quantum nent kit Qiskit, wh and experience  Z,ZK ts, outputs, data gn tools. The sub ons to higher pro	5 technologinich is base with Pytho 6 storage an iject teache ogramming
Course aims at given are based, and algon Python languation BI-SAP Students understate transfer. In the label basic knowledge BI-SCE1 The Seminar of Co	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. No previous students work in open-source software developming. See 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputed in the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	n which quantum nent kit Qiskit, wh and experience  Z,ZK ts, outputs, data gn tools. The sub ons to higher pro  Z failures and atta	5 technological is base with Pytho 6 storage ariject teache ogramming 4 cks. Studer
Course aims at given are based, and algon Python languation BI-SAP Students understateransfer. In the labbasic knowledge BI-SCE1 The Seminar of Coare approached in	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. No previous students work in open-source software developming. 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputes, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I  Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to advividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	n which quantum nent kit Qiskit, wh and experience  Z,ZK tts, outputs, data gn tools. The sub ons to higher pro  Z failures and atta subject is work v	5 technologich is base with Pytho 6 storage ar iject teache ogramming 4 cks. Studer with scientifications
Course aims at given are based, and algon Python languation BI-SAP Students understateransfer. In the labbasic knowledge BI-SCE1 The Seminar of Coare approached in	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developming. No previous students work in open-source software developming. See 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputed in the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	n which quantum nent kit Qiskit, wh and experience  Z,ZK tts, outputs, data gn tools. The sub ons to higher pro  Z failures and atta subject is work v	5 technologich is base with Pytho 6 storage an iject teache ogramming 4 cks. Studer with scientif
Course aims at given are based, and algon Python languation BI-SAP Students understateransfer. In the lab basic knowledge BI-SCE1 the Seminar of Coare approached in	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developinge. 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputes, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I  Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to adividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the professional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher semester.	n which quantum nent kit Qiskit, wh and experience  Z,ZK tts, outputs, data gn tools. The sub ons to higher pro  Z failures and atta subject is work v	5 technologich is base with Pytho 6 storage an iject teache ogramming 4 cks. Studer with scientif
BI-SCE2  BI-SCE2	Quantum algorithms and programming ing students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or gorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developinge. 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.  Computer Structure and Architecture and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputes, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connection languages.  Computer Engineering Seminar I  Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to adividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the professional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	n which quantum nent kit Qiskit, wh and experience  Z,ZK tts, outputs, data gn tools. The sub ons to higher pro  Z failures and atta subject is work v s. The topics are	5 technologic inich is base with Pytho 6 storage an iject teache orgramming 4 cks. Studer with scientif new for ea
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BI-SOJ	Machine Oriented Languages	Z,ZK	4
	irse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal us	•	
and efficient coope	ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view lin This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	nked to higher leve	ıı ıanguages.
BI-SP1	Team Software Project 1	KZ	4
	ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided by th	I	1
-	that teaches the necessary techniques and theory. Teams consisting of 4-6 students will work on a specific project. The teacher, in the		
leader, regularly co	onsults with the team (at the seminars) with respect to both the formal and material aspects of the design. The resulting work will be f	urther developed	and finished
BI-SP1.21	in the BEI-SP2 course.  Team Software Project 1	KZ	5
	ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the		_
concurrently and the	nat teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teach	er, in the role of th	ne team and
project leader, regu	ularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software art	efact will be further	er developed
BI-SP2	and finished in the BIE-SP2 course.  Team Software Project 2	KZ	6
	IEAM Software Froject 2  s-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result	I	_
However, this time	the functionality, testing and documenting of the system being developed will be emphasized. Students will work in teams of 4-6 pec	ple. The teacher, i	in the role of
	ject leader, regularly consults with the team (at the seminars) with regard to the formal as well as material aspects of their solution. T		e that runs
BI-SP2.1	urrently will provide the students with supporting knowledge, especially in the area of teamwork, testing and quality assurance of the second Team Software Project 2	KZ	4
DI-3F2.1	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	KZ	4
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based or	knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In page 1		
	queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of participation of the participa		
	exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan ar ed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora	•	•
	PostgreSQL.	, .	, , ,
BI-SRC	Real-time systems	KZ	4
	e basic knowledge in the Real-time theory and in the design methods for RT systems including the dependability issues. Thereticla kn	-	
experimentally veri	fied on the practical labs of the Department of Digital Design. This subject is mainly based on embedded R-T systems, therefore the as in BI-VES subject and FPGA.	used design kits a	ire the same
BI-SSB	System and Network Security	Z,ZK	5
	This course is focused on selected areas of computer networks and computer systems in terms of cyber security	,	1
BI-ST1	Network Technology 1	Z	3
The subject is or	lented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredite CCNA1 - R&S Introduction to Networks.	d under the Cisco	Netacad -
BI-ST2	Network Technology 2	Z	3
D1 012	This course is presented in Czech.	_	1 0
BI-ST3	Network Technology 3	Z	3
	er enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during E		
get further extend	ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predisimple topology, security, etc.	ctability, extension	i beyond a
BI-ST4	Network Technology 4	Z	3
	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching	_	1
	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici		
-	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely 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.		
BI-STO	Storage and Filesystems	Z,ZK	4
The student will lea	rn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and arch load balancing and high availability.	ving, as so as sto	rage scaling,
BI-SVZ	Machine vision and image processing	Z,ZK	5
	are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in		1
introduces students	s to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use	of camera system	ns for solving
BI-TDA	problems of practice that the graduates may encounter.	KZ	4
	Test driven architecture cused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a	I .	1
	urse has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occu		
BI-TEX	TeX and Typography	Z,ZK	4
This course is pres	ented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	course focuses on	typographic
BI-TIS	rules.  Information Systems Design	Z,ZK	5
	information Systems Design ious types of ISs and their practical implementation aspects and are able to match the needs of different market segments (customer	1	-
	technologies (databases, programming languages, GUI etc.).	, .,,	
BI-TJV	Java Technology	Z,ZK	4
	s to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programmi		
to bulla the three	and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb course end is student able to create three layers enterprise application.	) services, JNDf 6	ic.). At the
	222.22 2.12 of about able to croate three tay of other price appropriation		

BI-TS1 Theoretical Seminar I Ζ Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS2 Z Theoretical Seminar II 4 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. User Interface Design Z,ZK Students have a basic overview of the methods for designing and testing common user interfaces. They have experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of the methods that bring users into the development process to ensure optimal communication with a user. BI-TWA.1 Web Application Design The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV\* framework AngularJS BI-ULL Introduction to Linux 2 Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). Selected Applications of Combinatorics BI-VAK.21 3 The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. **BI-VES Embedded Systems** Z,ZK 5 Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools. Virtual game worlds The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,...). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices. Selected Mathematical Methods We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail. BI-VR1 ΚZ Virtual reality I Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves computational thinking, empathy and shared social activities. RI-VR2 Virtual reality II 3 Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The objective is to develop applications for computer science and gamification in various social metaverse and desktop engines. BI-VWM Searching the Web and Multimedia Databases Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents). BI-VZD Data Mining Z,ZK Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering). XML Technology Students learn to make and validate XML documents (XML Schema, Relax, Schematron) and learn standard methods of their processing (SAX, DOM). An emphasis will be given to language XPath which enables addressing of parts of XML documents and its usage in different XML technologies. Students will also learn basics of XSLT programming. XSLT and XPath programming will be based on version 2.0. Students will gain a broad overview of XML technologies. Elements of Discrete Mathematics Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, tools for solving recurrent equations, and basics of graph theory.

modern humanoid rol	Intelligent Embedded System Fundamentals		
modern humanoid rol interfaces, robot navi		KZ	4
nterfaces, robot navi	I system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the bot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control,		
	igation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get prac	_	
BI-ZMA	technologies.		
	Elements of Calculus	Z,ZK	6
Students acquire kn	nowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and	reasoning and	are able to
=	nniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links		itegrals and
	ums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expre		
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain the	basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popul knowledge should serve for the efficient creation of a web backend in PHP language.	ai iiaiiiewoik.	The resulting
BI-ZNS	Knowledge-based Systems	Z,ZK	5
1	e familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intelligent		1
	nent, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowledge	-	
decis	sion-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutionary	algorithms.	
BI-ZPI	Process engineering	KZ	4
	ndamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of proc	•	
	sed notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business		
CASE loois. The fole	of process engineering for information systems development is discussed as well as its importance in the overall context of informatic an enterprise.	n and busines	is strategy of
BI-ZRS	Basics of System Control	Z,ZK	4
-	n introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus ou		1
•	ng and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description m	•	•
basic linear dynamic	systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating	a description of	of the system
	near dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to		
control loops, issues	of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial imp	elementation of	f continuous
DI 7010	and digital controllers and PLC control.	Z	10
BI-ZS10	Bachelor internship abroad for 10 credits  nce within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or resea	_	10 Before the
	of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional		
•	courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corresponding		
employment with a fo	reign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two	vo subjects if the	he internship
	exceeds the academic year's dead-line.		
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	nce within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research the SIT at the stide of the study of the state of the stat		
•	of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspondence.		
	preign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two		
, ,	exceeds the academic year's dead-line.	•	
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
	nce within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research		00
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	arch institution.	
•		content and e	Before the extent of the
internship. Auxiliary c	courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corresponding	content and e cond to 4 week	Before the extent of the ks of full-time
internship. Auxiliary c	courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corresponding in institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two	content and e cond to 4 week	Before the extent of the ks of full-time
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FI-KSA	Cultural and Social Anthropology	ZK	2
	course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity	•	•
anthropological res	search from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, health	n, history, death, e	tc) will be
	shown. The course is an interesting alternative to other humanities, taught at FIT.		_
FI-MPL	Managerial Psychology	ZK	2
FI-ULI	Introduction to Linguistics for Computer	ZK	2
	This course is presented in Czech.	_	
FI-VEZ	economic-managerial course from a study abroad	Z	4
A "Humanities sub	bject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that	is required in the	curriculum.
NI AED	The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.	V7	
NI-AFP	Applied Functional Programming	KZ	5
'	sented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional p s and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master		-
The rise nowadays	necessary competence of a software engineer: the theory and especially the practice.	ing this paradigm	becomes a
NI-DDM	Distributed Data Mining	KZ	4
	n state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of		1 -
	amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a		
	approaches to parallelize other algorithms. The course is prezented in czech language.		
NI-DSP	Database Systems in Practes	Z,ZK	4
	This course is presented in Czech.	,	I
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	orithms that are b	oth easy to
•	e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is als		
	processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR	•	_
	, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conv		
	igid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		1
NI-IAM	Internet and Multimedia	Z,ZK	4
	se is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq	_	
·	signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical u		
	missions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effective to the control of		-
the quality and late	ency of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the for audience.	e scene up to the p	presentation
NI-LSM	Statistical Modelling Lab	KZ	5
	iented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p		_
	ion and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and		
		o analyses of their	properties
		•	properties.
	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).	
NI-MOP	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  Modern Object-Oriented Programming in Pharo	s).	4
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NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and organizations. They will get			
acquainted with v	rirtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	ently operate and o	ptimize the
performance pa	arameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology toda	ay for the
management of co	omplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in	n the use of moderr	n integration
	and development tools (Continuous integration and development).		
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.		
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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