Study plan

Name of study plan: Bachelor branch Security and Information Technology, in English, 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: 158
Elective courses credits: 22
Sum of credits in the plan: 180

Note on the plan: The study plan is intended for those students who have been accepted to study since the

academic year 2015/2016.

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: BIE-PP.2015

Name of the group: Compulsory Courses od Study Program Infomatics, Presented in English, 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

Note on the group:

Note on the g	roup:					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-AG1	Algorithms and Graphs 1 Dušan Knop	Z,ZK	6	2P+2C	Z	PP
BIE-AAG	Automata and Grammars	Z,ZK	6	2P+2C	Z	PP
BIE-BPR	Bachelor Project Zden k Muziká Zden k Muziká (Gar.)	Z	2		Z,L	PP
BIE-BAP	Bachelor Thesis Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BIE-PSI	Computer Networks	Z,ZK	5	2P+1R+1C	L	PP
BIE-SAP	Computer Structures and Architectures	Z,ZK	6	2P+1R+2C	L	PP
BIE-DBS	Database Systems	Z,ZK	6	3L	Z,L	PP
BIE-CAO	Digital and Analog Circuits	Z,ZK	5	2P+2C	Z	PP
BIE-DPR	Document., Presentation, Rhetorics Dana Vynikarová Dana Vynikarová Dana Vynikarová (Gar.)	KZ	4		L	PP
BIE-ZMA	Elements of Calculus Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BIE-ZDM	Elements of Discrete Mathematics Ji ina Scholtzová, Jan Legerský Ji ina Scholtzová Josef Kolá (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-LIN	Linear Algebra Antonella Marchesiello Antonella Marchesiello (Gar.)	Z,ZK	7	4P+2C	L	PP
BIE-MLO	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-OSY	Operating Systems	Z,ZK	5	2P+1R+1L	. L	PP
BIE-PST	Probability and Statistics	Z,ZK	5	2P+1R+1C	Z	PP
BIE-PA1	Programming and Algorithmics 1	Z,ZK	6	2P+2R+2C	Z	PP
BIE-PA2	Programming and Algorithmics 2 Jan Trávní ek	Z,ZK	7	2P+1R+1C	L	PP
BIE-PS1	Programming in Shell 1	KZ	5	2P+2C	Z	PP

BIE-BEZ	Security Ji í Bu ek	Z, Z	K 6	2P+1R+1C	L	PP
BIE-SI1.2	Software Engineering I Zden k Rybola Zden k Rybola (Gar.)	Z,Z	ĽK 5	2P+1C	Z,L	PP
Characteristics of the Presented in English,	courses of this group of Study Plan: Code=BIE- Version 2015	PP.2015 Name=Compul	sory Courses	od Study F	rogram	Infomatio
BIE-AG1 Alg	orithms and Graphs 1			Z,	ZK	6
	s from the efficient algorithm design, data structures, and graph					
ractically the asymptotic ma	and BIE-ZDM courses in which the students gain the basic skill	is and knowledge needed for tin	ie and space comp	olexity of algori	tnms and i	earn to nand
	omata and Grammars			7	ZK	6
	asic theoretical and implementation principles of the following to	pics: construction, use and mut	ual transformations			
	ation finite automata, construction and use of pushdown automa		· · · · · · · · · · · · · · · · · · ·			
	the module is applicable in designs of algorithms for searching	in text, data compression, simp	e parsing and tran			
At the beginning of the seme	chelor Project ster the student will contact the supervisor of the bachelor thesi sks, the supervisor will award him / her at the end of the semest		uss the partial task	1	Z will perform	2 n during the
	chelor Thesis	ior war are bribling occurs.			Z	14
	mputer Networks				ZK	5
Students understand the bas	ic common techniques, protocols, technologies, and algorithms	necessary to communicate in c	omputer networks	1		d to 4th laye
=	also get a basic understanding of communication media, security	y, and network administration. S	tudents will be abl	e to write a sin	nple networ	rk application
and configure a simple netwood				7	71/	6
-	mputer Structures and Architectures igital computer units and their structures, functions, and hardwa	re implementation: ALU, control	unit, memory sys	1 '	ZK touts. data	-
	gain practical experience with the design and implementation of	· ·		-	-	
BIE-DBS Da	abase Systems			Z,	ZK	6
	e database engine architecture and typical user roles. They are	=		=	-	
	 s) using a conceptual model and implement them in a relational relational database model. They learn the principles of normalizing 		•			
	el user access to a single data source, as well as recovering a c	=	-		-	
	espect to speed of access to large quantities of data. This introd	-	-	-	-	-
	ons, distributed database systems, data stores.					
	ital and Analog Circuits				ZK	5
-	I understanding of technologies underlying electronic digital sys d conductors. They are able to design simple circuits and evalua					=
f electronic devices.	d conductors. They are able to design simple circuits and evalue	ate offerit parameters. They und	sistana tric amere	nices between	analog and	a digital mod
BIE-DPR Do	cument., Presentation, Rhetorics			k	Z	4
	ofessional communication and writing of the scientific texts (bache	· · · · · · · · · · · · · · · · · · ·				-
and presenting before an au- tart of the semester.	lience. Students will also learn to write technical reports and sci	ientific texts. There is no fixed so	hedule for BIE-DP	R. A teacher v	vill contact	you before t
	ments of Calculus			7	ZK	6
		that they are able to apply math	nematical way of th	1		•
Students acquire knowledge		, , , , , , , , , , , , , , , , , , , ,	-	-	_	
· · · · · · · · · · · · · · · · · · ·	and understanding of the fundamentals of classical calculus so hey get skills to practically handle functions of one variable in s	olving the problems in informati	oor ring, arragionar	id the links bet	ween the ir	ntegrals and
se basic proof techniques.	and understanding of the fundamentals of classical calculus so	• .	•			ntegrals and
se basic proof techniques. ums of sequences. They are BIE-ZDM	and understanding of the fundamentals of classical calculus so hey get skills to practically handle functions of one variable in seable to estimate lower or upper bounds of values of real function ments of Discrete Mathematics	ons and to handle simple asymp	ototic expressions.	Z,	ZK	5
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BIE-PS1 Programming in Shell 1

KZ

Students understand the basic principles of operating systems (processes and threads, file systems, access rights, memory management, network interface) with a focus on UNIX like operating systems. In practically oriented exercises, they will learn to use shell, basic commands and filters for processing text data.

BIE-BEZ Security

Z,ZK

'K 6

Students understand the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric and asymmetric cryptosystems, and hash functions. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptosystems for computer systems. They are able to properly and securely use cryptographic primitives and systems that are based on these primitives. Students are introduced to legal aspects of information security, security standards, social engineering, and basic principles of security management.

BIE-SI1.2 Software Engineering I

Z,ZK

5

Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. Students will get acquainted with CASE tools using a visual modeling language UML for modeling and solving software-related problems. Students will get an overview of object-oriented analysis, design, architecture, validation, verification, and testing processes. The knowledge obtained in the lectures is practiced on a team project. If enrolled for the BIE-SP1 course running in parallel (only summer semester), the students can work on a single more complex project and they are classified to both courses for a single project. This course does not teach the students programming, nor any particular technology, framework or programming language. The students are required to have some knowledge of these to apply them on their team project.

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 32

The role of the block: PO

Code of the group: BIE-PO-BIT.2015

Name of the group: Compulsory Courses of Bc. Branch Security and Information Technology, in English,

Version 2015

Requirement credits in the group: In this group you have to gain 32 credits

Requirement courses in the group: In this group you have to complete at least 7 courses

Credits in the group: 32

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
BIE-APS.1	Architectures of Computer Systems	Z,ZK	5	2P+2C	Z	РО
BIE-HWB	Hardware Security Filip Kodýtek, Róbert Lórencz, Ji í Bu ek Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	РО
BIE-PAI	Law and Informatics	ZK	3	2P	Z	РО
BIE-BEK	Secure Code Róbert Lórencz	Z,ZK	5	2P+2C	L	РО
BIE-SSB	System and Network Security Ji í Dostál Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	РО
BIE-ADU.1	Unix Administration	Z,ZK	5	2P+2C	L	РО
BIE-ADW.1	Windows Administration Miroslav Prágl, Ji í Kašpar Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	РО

Characteristics of the courses of this group of Study Plan: Code=BIE-PO-BIT.2015 Name=Compulsory Courses of Bc. Branch Security and Information Technology, in English, Version 2015

IE-APS.1 Architectures of Computer Systems

Z,ZK

5

Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of programs. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such systems.

BIE-HWB Hardware Security

Z,ZK

5

The course deals with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar with the operating principles of cryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.

BIE-PAI Law and Informatics

ZK

3

Students have knowledge of fundamental protection of intangible property, overview of contractual aspects of copyright. They are able to design an appropriate contract-based copyright protection and do research and verification of the outputs concerning trademarks, patents, industrial design rights. They are able to participate actively in the proceedings to register intangible property. They have a good overview of the Czech Republic legislation as well as the EU legislation.

BIE-BEK Secure Code

Z,ZK

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The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.

BIE-SSB System and Network Security

Z.ZK

5

The students will understand the public key infrastructure (PKI), its strengths and weaknesses, its vulnerabilities againstattacks. The students will also understand the analysis of network protocols from the perspectives of: authentication and authorisation, key exchange, and encryption. They get an overview of the security mechanisms of operating systems (OSs), of the ways virtualization canbe used to protect OSs, and of the security mechanisms for the OS memory. The students will learn basic methods of forensic analysis of storage media and networks. The students will also understand security of the networking infrastructure and its protocols andwill be able to design and implement a secured and survivable network. Students will also get an overview of securing data in clouds, database systems, and servers.

BIE-ADU.1Unix AdministrationZ,ZK5BIE-ADW.1Windows AdministrationZ,ZK4

Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.

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: BIE-PV-EM.2015

Name of the group: Compulsory Elective Economics, and Management Courses, in English, Version 2015

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 10)

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

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
BIE-EPR	Economic project Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	VE
BIE-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	VE
BIE-MIK	Fundamentals of Microeconomics Tomáš Evan, Pavla Vozárová Tomáš Evan Pavla Vozárová (Gar.)	Z,ZK	4	2P+2C	L	VE
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	VE

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-EM.2015 Name=Compulsory Elective Economics, and Management Courses, in English, Version 2015

BIE-EPR	Economic project	Z	1
This course is an extens	sion of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher	will contact you b	efore the start of
the semester.			

BIE-FTR.1 Financial Markets

Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and

globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.

BIE-MIK	Fundamentals of Microeconomics	Z,ZK	4	
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This a introductory course of microeconomics designed for students without previous economic background. It describes different market regimes and ways how firm can react to consumer demand, competitor strategies, government intervention, uncertainty and information asymmetry. All concepts are illustrated on real life examples.

3

BIE-EHD	Introduction to European Economic History	7 7K	
DIL-LIID	Introduction to European Economic History	Z,ZI	

The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.

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

The role of the block: PE

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

Name of the group: Compulsory Economics and Management Bachelor Courses, in English, 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:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-EMP	Economic and management principles Tomáš Evan Tomáš Evan (Gar.)	KZ	4	2P+2C	Z,L	PE

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

Economic and management principles

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 humanities courses

Minimal number of credits of the block: 2

The role of the block: VH

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

Name of the group: Compulsory Elective Bachelor Social Courses, Presented in English, Ver. 2015

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 9)

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

Credits in the group: 2

Note on the group:

Faculty guarantees the availability of these modules.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	VH
FI-HPZ	Humanities subject from a study abroad	Z	3	0+0	Z,L	VH
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	VH
BE0B16FI1	Philosophy 1 Peter Zamarovský Peter Zamarovský (Gar.)	KZ	4	2P+2S	Z,L	VH

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-HU.2015 Name=Compulsory Elective Bachelor Social Courses, Presented in English, Ver. 2015

BIE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a	selection of themes from the European economic history. It gives the student basic knowledge about forming of the global of	economy through	the description
of the key periods in his	tory. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econom	nic history. From la	arge economic
area of Roman Empire	o fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial insi	titutions is deciphe	ered. The course
does not cover detailed	economic history of particular European countries but rather the impact of trade and role of particular events, institutions an	d organizations in	history. Class
meetings will consist of	a mixture of lecture and discussion.		

7 7K

Students will master the methods traditionally used in mathematics and related disciplines - informatics - from different periods of the development of mathematics, and will thus become acquainted with mathematical methods suitable for applications in contemporary computer science.

FI-HPZ Humanities subject from a study abroad

3

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

Philosophy 1

We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.

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

The role of the block: V

Code of the group: BIE-V-PRO_MG

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

English

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

Credits in the group: 0

Modules in this group are recommended for students who intend to enroll to master Note on the group:

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
BIE-EFA	Efficient Algorithms Ji ina Scholtzová	Z,ZK	5	2P+2C	Z	V
BIE-GRA	Graph Algorithms and Complexity Theory	Z,ZK	5	2P+2C	L	V

Characteristics of the courses of this group of Study Plan: Code=BIE-V-PRO_MG Name=Elective Courses, Suitable for those who intend to apply for Master's program at FIT, in English

BIE-EFA Efficient Algorithms

Z,ZK

5

Students get an overview of efficient algorithms and data structures for solving classical algorithmic problems, such as searching and sorting, on dynamically changing data sets. Students are able to design and implement such algorithms, to use methods for analysing their computational and memory complexity. They understand the sorting algorithms with O(n.log n) time complexity, special sorting algorithms with linear complexity, algorithms for associative and address searching. They are able to use the efficient dynamic data structures, such as hash tables, search trees, balanced search trees, heaps, B-trees, and others. They are able to work with recursive algorithms and dynamic programming.

BIE-GRA Graph Algorithms and Complexity Theory

7 7K

5

Students get an overview of typical usages of graph models in computing. They learn algorithmic methods of solving graph problems. They understand algorithms for the key application domains of graph theory (flows in networks, heuristic search, approximation of complex problems). Students get basic competence in computer science background: they understand Turing machine models and issues of NP-completeness and NP-hardness.

Code of the group: BIE-BIT-VO.2017

Name of the group: Elective Vocational Courses for Bachelor Branch BIE-BIT, Version 2017

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

Credits in the group: 0

Note on the group:

Oborové předměty všech oborů včetně povinných předmětů zaměření s výjimkou oboru BIE-BIT-VO.2017

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) Algorithms and Graphs 2 BIE-AG2 Z.ZK 5 2P+2C L Ond ej Suchý **Conceptual Modelling BIE-KOM** Z,ZK 5 2P+2C Ζ V Marek Suchánek, Robert Pergl Robert Pergl (Gar.) **Data Mining BIE-VZD** Z.ZK 4 2P+2C Ζ Daniel Vašata, Rodrigo Augusto Da Silva Alves Daniel Vašata Daniel Vašata (Gar.) BIE-BIG ΚZ 4 2P+2C Ζ **DB Technologies for Big Data** Java Technology **BIE-TJV** Ζ Z,ZK 4 2P+2C V Ond ej Guth Object-Oriented Programming
Filip K ikava Filip K ikava Filip K ikava (Gar.) **BIE-OOP** 4 2P+2C Ζ Z,ZK BIE-PJP Z.ZK 2P+1C 5 L **Programming Languages and Compilers** Z **BIE-PPA** Z.ZK 5 2P+2C **Programming Paradigms BIE-VWM** Z,ZK 5 2P+1C L **Searching Web and Multimedia Databases** V **Software Engineering 2** BIE-SI2.3 Z,ZK 3 2P Ζ V Michal Valenta Michal Valenta Michal Valenta (Gar.) Team Software Project 1 BIE-SP1 ΚZ 4 2C Z.L Zden k Rybola BIE-SP2 K7 6 Ζ Team Software Project 2 V BIE-TWA.1 Z,ZK 5 Z Web Application Design 2P+2C V **BIE-XML** Z,ZK Z 2P+2C XML Technology

Characteristics of the courses of this group of Study Plan: Code=BIE-BIT-VO.2017 Name=Elective Vocational Courses for Bachelor Branch BIE-BIT, Version 2017

BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-KOM	Conceptual Modelling	Z,ZK	5

The course focuses on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the ability to distinguish key concepts in the domain, categorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will learn the basics of ontological structural modeling in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Students will also learn the basics of Enterprise Engineering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the DEMO methodology. The course is also designed with regard to the continuity of software implementations.

BIE-VZD Data Mining

∠,∠K

4

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).

BIE-BIG	DB Technologies for Big Data	KZ	4
	d into the field of Big Data. These are data that the standard relational databases cannot process efficientlydue to the size, ar	nd at the same time	e, their real-tim
rocessing can provide	information that can have key importance for thecompetitiveness of a company or organization. The course is focused pract	ically. Students lea	arn the most
nportant professionalt	echnologies, such as Apache Cassandra, Apache Hadoop, Apache Solr, and others. The course brings to students theoretic	alfoundation of alg	orithms used in
Big data systems. In the	e labs, students learn to develop their own applications on topof these technologies.		
BIE-TJV	Java Technology	Z,ZK	4
he subject goal is to in	troduce the programming language Java. The student gains practical experiences for smaller enterprise application program	nming. This subject	t presents how
build the three and n	nore layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestW	eb services, JNDI	etc.). At the
ourse end is student a	able to create three layers enterprise application.		
IE-OOP	Object-Oriented Programming	Z,ZK	4
bject-oriented program	mming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth	ner by message pa	ssing. In this
ourse we look at some	e of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software dev	elopment includin	g testing, error
anding, refactoring an			
IE-PJP	Programming Languages and Compilers	Z,ZK	5
udents master basic	methods of implementation of common high-level programming languages. They get experience with the design and impleme	ntation of individua	al compiler par
r a simple programmi	ng language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that	has a certain synta	ax into a targe
rm and write a compi	ler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages	s, but extends to all	l other progran
or parsing and process	sing text in a language defined by a LL(1) grammar.		
	Drogramming Daradigma	7 71/	
	Programming Paradigms	Z,ZK	5
	Searching Web and Multimedia Databases	Z,ZK Z,ZK	5 5
IE-VWM		Z,ZK	5
IE-VWM tudents gain basic kno e students will unders	Searching Web and Multimedia Databases owledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogestand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity re	Z,ZK enous data reposit	5 ory. In particula
IE-VWM tudents gain basic kno e students will unders	Searching Web and Multimedia Databases owledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogen	Z,ZK enous data reposit	5 ory. In particula
IE-VWM tudents gain basic kno e students will unders eterogenous multimed	Searching Web and Multimedia Databases owledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogestand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity re	Z,ZK enous data reposit	5 ory. In particula
IE-VWM tudents gain basic kno e students will unders eterogenous multimed IE-SI2.3	Searching Web and Multimedia Databases by by ledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterograph that the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity red a databases (unstructured data collections, respectively).	Z,ZK enous data reposite etrieval methods for Z,ZK	5 ory. In particula ocused on 3
IE-VWM tudents gain basic kno e students will unders eterogenous multimed IE-SI2.3 tudents will learn to wo e functions of individu	Searching Web and Multimedia Databases by by by by and Multimedia Databases by b	Z,ZK enous data reposite etrieval methods fo Z,ZK eguage (UML). The ents will also get an	5 ory. In particula ocused on 3 y will understal
IE-VWM rudents gain basic known as the students will understerogenous multimed IE-SI2.3 rudents will learn to work a functions of individual	Searching Web and Multimedia Databases by b	Z,ZK enous data reposite etrieval methods fo Z,ZK eguage (UML). The ents will also get an	5 ory. In particula ocused on 3 y will understa
IE-VWM tudents gain basic know we students will unders eterogenous multimed IE-SI2.3 tudents will learn to wo the functions of individual oftware testing and mo	Searching Web and Multimedia Databases by by by by and Multimedia Databases by b	Z,ZK enous data reposite etrieval methods fo Z,ZK eguage (UML). The ents will also get an	5 ory. In particula ocused on 3 y will understa
IE-VWM tudents gain basic known be students will underseterogenous multimed IE-SI2.3 tudents will learn to wo be functions of individual oftware testing and multi-SP1	Searching Web and Multimedia Databases owledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogestand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity redia databases (unstructured data collections, respectively). Software Engineering 2 ork methodically with respect to software development methodic, especially Unified Process methodic and Unified Modeling Larual roles in a typical software team, as well as get a practical experience with them in the concurrent BIE-SP2 module. Stude easuring software quality. This knowledge will get extended with a practical experience thanks to the concurrently running BII	Z,ZK enous data reposite etrieval methods for Z,ZK guage (UML). The ints will also get an E-SP2 module.	5 ory. In particulations on 3 y will understate idea about
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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.

BIE-XML XML Technology Z,ZK

Code of the group: BIE-V.2017

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

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	٧
BIE-ZRS	Basics of Systems Control	Z,ZK	4	2P+2C	L	٧
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	3P	L	V
BIE-SCE1	Computer Engineering Seminar I Miroslav Skrbek, Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	٧
BIE-SCE2	Computer Engineering Seminar II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	Czech Language for Foreigners Markéta Hofmannová, Ivana Vondrá ková, Tomáš Houdek, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	V
BIE-CZ1.21	Czech Language for Foreigners II Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	٧
BIE-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	V
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V

BIE-IMA	Introduction to Mathematics	Z	4	3C	Z	V
BIE-IMA2	Introduction to Mathematics 2	Z	2	1C	Z	V
BIE-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BIE-OOP	Object-Oriented Programming Filip K ikava Filip K ikava Filip K ikava (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PKM	Preparatory Mathematics Jitka Rybní ková Tomáš Kalvoda (Gar.)	Z	4		Z	V
BIE-PJV	Programming in Java Jan Blizni enko Jan Blizni enko Jan Blizni enko (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PS2	Programming in shell 2	Z,ZK	4	2P+2C	L	V
BIE-PRR.21	Project management David Pešek David Pešek (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BIE-VAK.21	Selected Combinatorics Applications Tomáš Valla, Dušan Knop, Ond ej Suchý, Šimon Schierreich, Maria Saumell Mendiola Tomáš Valla Tomáš Valla (Gar.)	Z	3	2R	L	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
TV2K1	Physical Education 2	Z	1		L,Z	V
BIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-3DT.1	3D Printing	KZ	4	3C	L	V

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

Financial Markets Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.

Introduction to European Economic History **BIE-EHD**

Z.ZK

The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.

BIE-OOP Object-Oriented Programming

Z,ZK

Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software development including testing, error handing, refactoring and design patterns.

BIF-7UM 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.

BIE-ZRS Basics of Systems Control

Z,ZK

Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. 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. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which 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. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.

BIE-CCN Compiler Construction

Z.ZK

5

This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class.

BIE-SCE1 Computer Engineering Seminar I

The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.

BIE-SCE2 Computer Engineering Seminar II

7

4

The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.

BIE-CZ0 Czech Language for Foreigners

ΚZ

2

Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family. Czech Language for Foreigners II BIE-CZ1.21

ΚZ

2

The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The course further expands the basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Republic.

BIE-IMA	Introduction to Mathematics	Z	4
Students refresh and	vixtend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they	are able to apply t	hem in particular
examples.			
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and	vitend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they	। are able to apply t	hem in particular
examples.			
BIE-ST1	Network Technology 1	Z	3
The course is focused	on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad c	urriculum, CCNA1	- R&S
Introduction to Networ	KS.		• •
BIE-PKM	Preparatory Mathematics	Z	4
	atory Mathematics is to help students revise the most important topics of high-school mathematics.	_	1
BIE-PJV	Programming in Java	Z.ZK	4
	ing in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Ja	1 '	1 1
	especially data structures, files, GUI, networking, databases and concurrent APIs.	va languago ino re	andamonia, 7 ii 10
BIE-PS2	Programming in shell 2	Z.ZK	4
_	overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In a	1 '	1 1
"	I and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmi		
	even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp		
	tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a s		
techniques used in pra			
BIE-PRR.21	Project management	Z.ZK	5
1	is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, a	1 '	
	n, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk	•	·
' ' '	schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for		
· ·	edge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in		
	se who will develop software or hardware in the form of team projects.		
BIE-VAK.21	Selected Combinatorics Applications	Z	3
	roduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to t	_	
	to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some to		
	ation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical)		•
will select problems to	be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optir	mization and more	. Students will
also try to implement s	olutions to the studied problems with a special focus on the effective use of existing tools.		
BI-SCE1	Computer Engineering Seminar I	Z	4
	ter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistan	nce to failures and	attacks. Students
•	ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of		
articles and other profe	essional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea	achers. The topics	are new for each
semester.			
TV2K1	Physical Education 2	Z	1
BIE-SEP	World Economy and Business	Z.ZK	4
	students of technical university to the international business. It does that predominantly by comparing individual countries ar	1 '	vorld economy.
	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo	, ,	•
_	e needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on i		
	his course BIE-SEP as a prerequisite.	· ·	
BIE-3DT.1	3D Printing	KZ	4
_	an three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design obj	1	
in 3D.	,	, p p	9

List of courses of this pass:

Code	Name of the course	Completion	Credits
BE0B16FI1	Philosophy 1	KZ	4
We deal with the	e most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philos	ophy and connect	ion of old
	philosophical thoughts with recent problems of science, technology, economics and politics.		
BI-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Co	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	failures and attac	ks. Students
are approached in	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	subject is work wi	th scientific
articles and other p	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	rs. The topics are r	new for each
	semester.		
BIE-3DT.1	3D Printing	KZ	4
Students learn to	design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects	, prepare for printir	ng and print
	in 3D.		
BIE-AAG	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 gramm	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between for	rmal languages an	d automata.
Knowledge acqui	red through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,	and design of digi	tal circuits.
BIE-ADU.1	Unix Administration	Z,ZK	5

BIE-ADW.1	Windows Administration	Z,ZK	4
	and the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the		
security tools a	nd apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.	methods and adm	inistrate
BIE-AG1	Algorithms and Graphs 1	Z,ZK	6
	s the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computi		
	BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of	_	
	practically the asymptotic mathematics.		
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-APS.1	Architectures of Computer Systems	Z,ZK	5
	n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec	· · · · · · · · · · · · · · · · · · ·	
•	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the prin- 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	•	
BIE-BAP	Bachelor Thesis	Z	14
BIE-BEK	Secure Code	Z,ZK	5
	arn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa		-
• •	gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		
•	ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and th		
BIE-BEZ	Security	Z,ZK	6
	d the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric:	· '	
and hash functions	. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptos	ystems for comput	er systems.
They are able to p	roperly and securely use cryptographic primitives and systems that are based on these primitives. Students are introduced to legal a	spects of information	on security,
DIE DIC	security standards, social engineering, and basic principles of security management.	1/7	4
BIE-BIG Students are introd	DB Technologies for Big Data uced into the field of Big Data. These are data that the standard relational databases cannot process efficientlydue to the size, and a	KZ	4 eir real-time
	provide information that can have key importance for the competitiveness of a company or organization. The course is focused practic		
	onaltechnologies, such as Apache Cassandra, Apache Hadoop, Apache Solr, and others. The course brings to students theoreticalfo	=	
	Big data systems. In the labs, students learn to develop their own applications on topof these technologies.		
BIE-BPR	Bachelor Project	Z	2
At the beginning of	of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that s semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.	tudent will perform	during the
BIE-CAO	Digital and Analog Circuits	Z.ZK	5
	fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and	,	_
_	circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences between		=
	of electronic devices.		
BIE-CCN	Compiler Construction	Z,ZK	5
	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	•	
BIE-CZ0	Czech Language for Foreigners	KZ	2
0-0	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Tim		_
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2
	nded for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The		pands the
	vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the		
BIE-DBS	Database Systems oduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They lear	Z,ZK	6
	constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the		
	ation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the funda-		
-	lling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced		-
in relational databa	ases with respect to speed of access to large quantities of data. This introductory-level module does not cover: Administration of data	base systems, deb	ugging and
BIE-DPR	optimizing database applications, distributed database systems, data stores. Document., Presentation, Rhetorics	KZ	4
	d to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and pi		
	ore an audience. Students will also learn to write technical reports and scientific texts. There is no fixed schedule for BIE-DPR. A tead		
	start of the semester.		
BIE-EFA	Efficient Algorithms	Z,ZK	5
-	overview of efficient algorithms and data structures for solving classical algorithmic problems, such as searching and sorting, on dyn		
	to design and implement such algorithms, to use methods for analysing their computational and memory complexity. They understal plexity, special sorting algorithms with linear complexity, algorithms for associative and address searching. They are able to use the eff		
	nash tables, search trees, balanced search trees, heaps, B-trees, and others. They are able to work with recursive algorithms and dy	·=	
BIE-EHD	Introduction to European Economic History	Z,ZK	3
	uces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco		-
	in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	, ,	
	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institut tailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	=	
addd flot dover de	meetings will consist of a mixture of lecture and discussion.	90.1120110113 111 1113	.o. y. Olass
BIE-EMP	Economic 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 a		d, a relation
	between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination	l.	

			1
BIE-EPR	Economic project	Z	1
This course is an e	extension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will c	ontact you befor	e the start
	the semester.		1
BIE-FTR.1	Financial Markets	Z,ZK	5
	has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the		
	rket activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities		
	nools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of final se thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistica		
		Z.ZK	
BIE-GRA	Graph Algorithms and Complexity Theory erview of typical usages of graph models in computing. They learn algorithmic methods of solving graph problems. They understand algo	,	5
-	theory (flows in networks, heuristic search, approximation of complex problems). Students get basic competence in computer science by		
iomains or grapm	Turing machine models and issues of NP-completeness and NP-hardness.	background, they	understar
BIE-HMI	History of Mathematics and Informatics	Z,ZK	3
	er the methods traditionally used in mathematics and related disciplines - informatics - from different periods of the development of mathe	•	1
	acquainted with mathematical methods suitable for applications in contemporary computer science.		
BIE-HWB	Hardware Security	Z.ZK	5
	s with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar with	,	1
ryptographic mod	ules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about vul	nerabilities of HV	N resource
ncluding side-char	nnel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card tech	nology including	application
	and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of control of the control	ciphers.	
BIE-IMA	Introduction to Mathematics	Z	4
Students refresh a	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are ab	le to apply them	in particul
	examples.		
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh a	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are ab	le to apply them	in particul
	examples.		
BIE-KOM	Conceptual Modelling	Z,ZK	5
he course focuse	s on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the abilit	y to distinguish l	key concep
	tegorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will lea		_
	ng in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Students		
nterprise Engine	ering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the DEMC) methodology. I	he course
	also designed with regard to the continuity of software implementations.		
	1. 1	7 71/	
BIE-LIN	Linear Algebra	Z,ZK	7
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Students understa linear. They knov	ind the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies at the basic methods for operating with polynomials and linear spaces. They are able to perform matrix operations and solve systems of	among compone linear equations	nts are onl
Students understa linear. They knov a	ind the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies of the basic methods for operating with polynomials and linear spaces. They are able to perform matrix operations and solve systems of oply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand error-detecting and error-correct	among compone linear equations cting codes.	ents are onl s. They can
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BIE-PPA	Programming Paradigms	Z,ZK	5
BIE-PRR.21	Project management	Z,ZK	5
The aim of the co	ourse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, analyst	sis, crisis manag	gement in a
oroject, commun	ication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk ass	essment and ma	anagement,
Gantt charts, res	source schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students	dents who are in	iterested in
leepening their l	knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large	e companies. Th	e course is
	also suitable for all those who will develop software or hardware in the form of team projects.		
BIE-PS1	Programming in Shell 1	KZ	5
udents understa	and the basic principles of operating systems (processes and threads, file systems, access rights, memory management, network interfa	•	on UNIX li
	operating systems. In practically oriented exercises, they will learn to use shell, basic commands and filters for processing text d		
BIE-PS2	Programming in shell 2	Z,ZK	4
	neral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In additio		
-	shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus studies and will get practical experience with shell script programming.		-
	ovide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, n		
data filtering too	ols (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selective techniques used in practice.	ction of advance	a scripting
DIE DOI		7 71/	
BIE-PSI	Computer Networks	Z,ZK	5
	and the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks focusing p	-	-
the 150 OSI mi	odel. They also get a basic understanding of communication media, security, and network administration. Students will be able to write a and configure a simple network.	a simple network	Каррисанс
BIE-PST		Z,ZK	
	Probability and Statistics	•	5
	earn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables andom variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical inductior	-	
	andom variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction known distributional parameters from random sample characteristics. They will also be introduced to the methods of determining the sta	=	-
iadono di ulik	more random variables.		01 100
BIE-SAP	Computer Structures and Architectures	Z.ZK	6
_	and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, input	,	_
	er. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern di	-	_
BIE-SCE1	Computer Engineering Seminar I	7	4
	proputer Engineering Sertifical T	_	-
	ndividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the s		
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tiolog and other	professional instatute and/or work in the translations. The support of the subject to infinite by the possionated of the continual touchord		non ioi oa
	semester.		
BIE-SCE2	semester. Computer Engineering Seminar II		
BIE-SCE2	Computer Engineering Seminar II	Z	4
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BIE-TJV	Java Technology	Z.ZK	4
_	s to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programmin	,	1 1
	and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb		
to band in o amou	course end is student able to create three layers enterprise application.	00.11000, 0.12.0	10.717 11.10
BIE-TWA.1	Web Application Design	Z.ZK	5
!	of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties	,	
	and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications,		٠ ا
modern libraries fa	acilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony	2, Doctrine 2. De	evelopments
	on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework Angulard	JS.	
BIE-VAK.21	Selected Combinatorics Applications	Z	3
The course aims to	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the base	asic courses, we a	approach the
issue from applicat	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	data structures. F	Furthermore,
with the active par	ticipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info	rmatics. Areas fro	m which we
will select probler	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimize	ation and more. S	tudents will
	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		
BIE-VWM	Searching Web and Multimedia Databases	Z,ZK	5
_	c knowledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogenou		
the students wil	I understand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity re	trieval methods fo	cused on
	heterogenous multimedia databases (unstructured data collections, respectively).		
BIE-VZD	Data Mining	Z,ZK	4
	uced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multic		
•	es of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between the contraction of the relationships between the contractions are contracted by the contraction of the relationships between the relationships be		
and know the fur	ndamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic d	ata mining tools to	o common
5.5 \/	problems (classification, regression, clustering).		
BIE-XML	XML Technology	Z,ZK	4
BIE-ZDM	Elements of Discrete Mathematics	Z,ZK	5
Students get both a	a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula appro	eximation, and too	ls for solving
	recurrent equations.		
BIE-ZMA	Elements of Calculus		_
Students acquire		Z,ZK	6
	knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking a	nd reasoning and	are able to
use basic proof te	knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking a chniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the lin	nd reasoning and ks between the in	are able to
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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.

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Physical Education 2

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