## Study plan

## Name of study plan: Bachelor specialization, Software Engineering, 2021

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Informatics Type of study: Bachelor full-time Required credits: 155 Elective courses credits: 25 Sum of credits in the plan: 180 Note on the plan: This version of the study plan is intended for students who have been enrolled for study from the academic year 2021/2022 into the full-time form of study of the bachelor's program. . Guarantor: Ing. Michal Valenta, Ph.D., email: michal.valenta@fit.cvut.cz

Name of the block: Compulsory courses in the program Minimal number of credits of the block: 110 The role of the block: PP

Code of the group: BIE-PP.21

Name of the group: Compulsory Courses of Bachelor Study Program Informatics, version 2021 Requirement credits in the group: In this group you have to gain 110 credits Requirement courses in the group: In this group you have to complete 21 courses

Credits in the group: 110

Note on the group: If you plan to profile yourself in the specialization Information Security, Computer Networks and Internet, Computer Systems and Virtualization, or Software Engineering, enroll in the course BIE-PSI.21 in your 2nd semester of study. If you plan to profile yourself in the specialization Computer Engineering, or Computer Science, enroll in the course BI-PSI.21 in your 4th semester of study. - On the basis of the certificate of knowledge of English at the B2 level, which is stated in the conditions for admission to study, you can have the subject BIE-EEC recognized for 4 credits.

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-AG1.21	Algorithms and Graphs 1 Tomáš Valla, Dušan Knop, Maria Saumell Mendiola <b>Dušan Knop</b> Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-AAG.21	Automata and Grammars Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-BPR.21	Bachelor Project Zden k Muziká Zden k Muziká (Gar.)	Z	1		Z,L	PP
BIE-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BIE-PSI.21	Computer Networks Yelena Trofimova, Michal Polák, Diana Prokopisina Yelena Trofimova Yelena Trofimova (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-SAP.21	Computer Structures and Architectures Petr Fišer Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BIE-KAB.21	Cryptography and Security Ji í Bu ek, Filip Kodýtek, Róbert Lórencz Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BIE-DBS.21	Database Systems Josef Pavlí ek, Yelena Trofimova Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+2R+1L	. L	PP
BIE-DML.21	Discrete Mathematics and Logic Eva Pernecká, Jitka Rybní ková, Francesco Dolce Daniel Dombek Eva Pernecká (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-TDP.21	Documentation and Presentation Dana Vynikarová Dana Vynikarová Dana Vynikarová (Gar.)	ΚZ	3	2P+2C	Z,L	PP
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4		L	PP
BIE-LA1.21	Linear Algebra 1 Marzieh Forough Karel Klouda Marzieh Forough (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

BIE-MA1.21	Mathematical Analysis 1 Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-MA2.21	Mathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)	Z,ZK	6	3P+2C	Z	PP
BIE-OSY.21	Operating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BIE-PST.21	Probability and Statistics Pavel Hrabák, Francesco Dolce Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-PA1.21	Programming and Algorithmics 1 Josef Vogel, David Bernhauer, Jan Trávní ek, Ladislav Vagner, Radek Hušek Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BIE-PA2.21	Programming and Algorithmics 2 Josef Vogel, Jan Trávní ek, Ladislav Vagner, Radek Hušek Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BIE-GIT.21	SW Development Technologies Petr Pulc Petr Pulc (Gar.)	Z	3	2P	Z	PP
BIE-TZP.21	Technological Fundamentals of Computers Kate ina Hyniová, Martin Novotný Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-UOS.21	Unix-like Operating Systems Jakub Žitný, Jan Trdli ka, Zden k Muziká Zden k Muziká (Gar.)	KZ	5	2P+2C	Z	PP

BIE-AG1.21	Algorithms and Graphs 1	Z,ZK	5
The course covers the b	basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every complexity	uting curriculum.	t is interlinked
with the concurrent BIE-	AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity	of algorithms and	d learn to handle
practically the asymptot	ic mathematics.		
BIE-AAG.21	Automata and Grammars	Z,ZK	5
Students are introduced	to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of fir	nite automata, reg	ular expressions
and regular grammars,	ranslation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships betwee	n formal language	s and automata.
Knowledge acquired thr	ough the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translatio	n, and design of o	digital circuits.
BIE-BPR.21	Bachelor Project	Z	1
At the beginning of the	semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that	student will perfo	rm during the
semester. If he fulfill the	se tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.		
BIE-BAP.21	Bachelor Thesis	Z	14
BIE-PSI.21	Computer Networks	Z,ZK	5
The course introduces s	students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in loc	cal networks and i	n the Internet as
well. The lectures will be	e amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced netw	work technologies	. Students
practically verify configu	rations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS	3.	
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5
Students understand ba	sic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, in	nputs, outputs, da	ta storage and
transfer. In the labs, stue	dents gain practical experience with the design and implementation of the logic of a simple processor using modern digital de	esign tools.	
BIE-KAB.21	Cryptography and Security	Z,ZK	5
Students will understand	d the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able t	o use cryptograph	nic keys and
certificates in systems b	based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in a	pplications. Withir	n labs, students
will gain practical skills i	n using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedure	s of cryptanalysis	Students are
expected to be compete	ent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.		
BIE-DBS.21	Database Systems	Z,ZK	5
Students get acquainted	with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data stor	e (including integ	rity constraints)
using a conceptual mod	el and then implement them in a relational database engine. They get acquainted with the SQL language and also with its the	oretical basis - rel	ational database
model. They will get acc	uainted with the principles of relational database schema normalization. They understand the basic concepts of transaction	processing and co	ontrol of parallel
user access to a single	data source. At the end of the course, students will be introduced to alternative nonrelational database models.		
BIE-DML.21	Discrete Mathematics and Logic	Z,ZK	5
Students will get acquai	nted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts	from set theory v	vill be explained.
Special attention is paid	to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The co	ourse also lays do	wn the basics of
combinatorics and num	ber theory, with emphasis on modular arithmetics.		
BIE-TDP.21	Documentation and Presentation	KZ	3
The course is focused o	n the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typical	lly final university	heses. Students
learn to create text of a	technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically pr	esent it in front of	classmates and
the teacher. The course	is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 1	4 days of teachin	g. Within the
exercises of the course,	an active approach to the creation of individual parts of the bachelor's thesis is assumed.		
BIE-EEC	English language external certificate	Z	4
	n be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in E	nglish comparable	e to or exceeding
the B2 level of the Com	mon European Framework of Reference for Languages.		
BIE-LA1.21	Linear Algebra 1	Z,ZK	5
We will introduce studer	nts to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	eld of real and cor	nplex numbers
and also over finite field	s. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian eli	mination method (	GEM) and show
	ar manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eige	nvalues and eiger	vectors of a
matrix. We will also dem	nonstrate some applications of these concepts in computer science.		

BIE-MA1.21 Mathematical Analysis 1	Z,ZK	5
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine number	ers. Then we study	real sequences
and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of fu	nctions. This theor	etical foundation
is then applied to root-finding problems (iterative method of bisection and Newton's method), construction of cubic interpolation (spline), and formulation	and solution of sim	ple optimization
problems (i.e., the issue of finding extrema of functions). The course is closed with the Landau's asymptotic notation and methods of mathematical desc	cription of complex	ty of algorithms.
BIE-MA2.21 Mathematical Analysis 2	Z,ZK	6
The course completes the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students w	ill learn how to inte	grate by parts
and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylor's theorem	n to the computation	on of elementary
functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms	s, and its analysis ι	ising the Master
theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and	Hessian matrix, v	e study the
analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the in	ntegration of multiv	ariate functions.
BIE-OSY.21 Operating Systems	Z,ZK	5
In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread	implementations,	race conditions,
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS n	nonitoring. They ar	e able to design
and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows.		
BIE-PST.21 Probability and Statistics	Z,ZK	5
Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variable	s. They will be ab	e to apply basic
models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	they will be able to	perform
estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statist	ical hypotheses ar	d determining
the statistical dependence of two or more random variables.		
BIE-PA1.21 Programming and Algorithmics 1	Z,ZK	7
Students learn to construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, struct	ured), expressions	s, statements,
and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundame	ntal algorithms for	searching,
sorting, and manipulating linked lists and trees.		
BIE-PA2.21 Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack,	queue, enlargeab	le array, list, set,
table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming	(e.g., template pro	gramming,
copying/moving of objects, operator overloading, inheritance, polymorphism).		
BIE-GIT.21 SW Development Technologies	Z	3
This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce studer	ts to Git, the inform	nation manager
from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use.		
BIE-TZP.21 Technological Fundamentals of Computers	Z,ZK	5
Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how comput	er structures look l	ike at the lowest
level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to r	educe the consum	ption; what the
limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a	computer power s	upply looks like
(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.		
BIE-UOS.21 Unix-like Operating Systems	KZ	5
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative	functions of multi	user operating
systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic prop	erties of this OS fa	amily, such as
processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level	el of advanced us	ers who are not
only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface	, called shell.	
Name of the block: Povinné p edm ty specializace		

#### Minimal number of credits of the block: 40 The role of the block: PS

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Code of the group: BIE-PS-SI.21

Name of the group: Compulsory courses of specialization Software Engineering, version 2021 Requirement credits in the group: In this group you have to gain 40 credits Requirement courses in the group: In this group you have to complete 8 courses Credits in the group: 40 Note on the group: Guarantor: Ing. Michal Valenta, Ph.D., email: michal valenta@fit.cvut.cz

Note on the group	): Guarantor: ing. Michai Valenta,	Ph.D., emai	. michai	.valenta	@m.cvut.c	Ζ
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
BIE-KOM.21	Tutors, authors and guarantors (gar.) Conceptual Modelling Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-IDO.21	Introduction to DevOps Tornáš Vondra, Zden k Rybola Tomáš Vondra Zden k Rybola (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-TJV.21	Java Technology Ond ej Guth Ond ej Guth (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha <b>Filip K ikava</b> Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-PPA.21	Programming Paradigms Filip K ikava, Petr Máj, Tomáš Pecka, Tomáš Jakl <b>Jan Janoušek</b> Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	PS
BIE-SWI.21	Software Engineering Zden k Rybola Zden k Rybola (Gar.)	Z,ZK	5	2P+1C	L	PS

BIE-SP1.21	Team Software Project 1 Ji í Mlejnek, Zden k Rybola Zden k Rybola (Gar.)	KZ	5	4C	L	PS
BIE-SP2.21	Team Software Project 2 Zden k Rybola Zden k Rybola Zden k Rybola (Gar.)	KZ	5	2C	Z	PS

# Characteristics of the courses of this group of Study Plan: Code=BIE-PS-SI.21 Name=Compulsory courses of specialization Software Engineering, version 2021

BIE-KOM.21	Conceptual Modelling	Z,ZK	5
The course is focused of	n developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key	, terms in a doma	in, the ability to
categorize and specify of	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 repres	sentation in the In	ternet. They also
learn the foundations of	enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEM	IO method and the	e BPMN notation
will be taught. The cours	se is designed with the respect to continuation in software implementations.		
BIE-IDO.21	Introduction to DevOps	Z,ZK	5
The course deals with the	ne topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of	, systems and serv	ices. The course
covers the tools to supp	ort software development, testing and compilation. It also focuses on tools for automating infrastructure management and bu	ilding and deploy	ing software to
the Cloud. It is an introd	uction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquai	nted with modern	technologies
used in practice.			
BIE-TJV.21	Java Technology	Z,ZK	5
The aim of the course is	to provide knowledge and skills needed for the development of smaller and larger information systems. Students will get ac	quainted with gen	eral theoretical
concepts and will be ab	le to apply these concepts using libraries and tools from the ecosystem of the Java programming language. After completing	the course stude	nts will be able
to participate in the dev	elopment of software systems on the Java platform. Students are assumed to be acquainted with the following topics (they a	re used and not ta	aught in this
course): Java language	syntax, SQL, git version control system, Docker, continuous integration.		
BIE-OOP.21	Object-Oriented Programming	Z,ZK	5
Object-oriented program	ming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth	er by message pa	assing. In this
course students get acq	uainted with the main principles of object-oriented programming and design, used in modern programming languages. The e	mphasis is on pra	ctical techniques
for developing software,	which includes testing, error handing, refactoring, and application of design pattern.		
BIE-PPA.21	Programming Paradigms	Z,ZK	5
	Programming Paradigms asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par		-
The course deals with b		ticular approache	s. Functional
The course deals with b programming paradigm	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par	ticular approache . The principles a	s. Functional re demonstrated
The course deals with b programming paradigm	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming	ticular approache . The principles a	s. Functional re demonstrated
The course deals with b programming paradigm on lambda calculus and	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming	ticular approache . The principles a	s. Functional re demonstrated
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mair	ticular approache p. The principles a nstream programm Z,ZK	s. Functional re demonstrated ning languages
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mair Software Engineering	ticular approache . The principles a istream programm Z,ZK / consolidate and	s. Functional re demonstrated ning languages 5 practically verify
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted their knowledge during t	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	ticular approache b. The principles a istream programm <b>Z,ZK</b> y consolidate and ds-on experience	s. Functional re demonstrated ning languages 5 practically verify with CASE tools
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted their knowledge during t using the visual language	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han	ticular approache b. The principles a istream programm <b>Z,ZK</b> y consolidate and ds-on experience in and testing. With	s. Functional re demonstrated ning languages 5 practically verify with CASE tools
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted their knowledge during t using the visual language	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design	ticular approache b. The principles a istream programm <b>Z,ZK</b> y consolidate and ds-on experience in and testing. With	s. Functional re demonstrated ning languages 5 practically verify with CASE tools
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted their knowledge during t using the visual languag students also gain a the BIE-SP1.21	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig poretical basis in the field of project management, estimation of costs of software projects, and methods of their development	ticular approache The principles a Instream programm Z,ZK consolidate and ds-on experience and testing. With KZ	s. Functional re demonstrated ning languages 5 practically verify with CASE tools thin the course, 5
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquainted their knowledge during t using the visual languag students also gain a the BIE-SP1.21 Students gain hands-om	Asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture designer to assis in the field of project management, estimation of costs of software projects, and methods of their development Team Software Project 1	ticular approache The principles a stream programm Z,ZK consolidate and ds-on experience in and testing. With KZ e BIE-SWI course	s. Functional re demonstrated ning languages 5 practically verify with CASE tools thin the course, 5 e that runs
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquaintee their knowledge during t using the visual languag students also gain a the BIE-SP1.21 Students gain hands-on concurrently and that te	Asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main Software Engineering d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design oretical basis in the field of project management, estimation of costs of software projects, and methods of their development Team Software Project 1 experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	ticular approache The principles a stream programm Z,ZK consolidate and ds-on experience in and testing. With KZ e BIE-SWI course acher, in the role	s. Functional re demonstrated ning languages 5 practically verify with CASE tools thin the course, 5 e that runs of the team and
The course deals with b programming paradigm on lambda calculus and such as C++ and Java. BIE-SWI.21 Students get acquaintee their knowledge during t using the visual languag students also gain a the BIE-SP1.21 Students gain hands-on concurrently and that te	asic paradigms of high-level programming languages, including their basic execution models, benefits, and limitations of par and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main <b>Software Engineering</b> d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get han ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture designeretical basis in the field of project management, estimation of costs of software projects, and methods of their development <b>Team Software Project 1</b> experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the aches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The te consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	ticular approache The principles a stream programm Z,ZK consolidate and ds-on experience in and testing. With KZ e BIE-SWI course acher, in the role	s. Functional re demonstrated ning languages 5 practically verify with CASE tools thin the course, 5 e that runs of the team and
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### Name of the block: Compulsory elective courses Minimal number of credits of the block: 5 The role of the block: PV

### Code of the group: BIE-PV-SI.21

Name of the group: Compulsory elective courses of the specialization Software Engineering, version 2021 Requirement credits in the group: In this group you have to gain at least 5 credits (at most 15) Requirement courses in the group: In this group you have to complete at least 1 course ( at most 3) Credits in the group: 5 Note on the group: Guarantor: Ing. Michal Valenta, Ph.D., email: michal.valenta@fit.cvut.cz

Note on the group		r n.D., cinai	i. michai	.vaicinta	unicounce	~
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-EPP.21	Economic Business Processes Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-PAI.21	Law and Informatics Zden k Ku era, Dominik Vítek Dominik Vítek Zden k Ku era (Gar.)	ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-SI.21 Name=Compulsory elective courses of the specialization Software Engineering, version 2021

The aim of the course is to in the market environment establishment of the comp	conomic Business Processes opresent typical processes related to the usual life cycle of a company. The course focus of the Czech Republic and the basics of management. In the course, students are acque pany, through the management of property and capital structure, financing of the compar- alth of the company and its eventual rehabilitation or termination.	ainted with the typ	pical phases	omic and fin of the com	pany's life cycle	e, from the
The aim of the course is to Republic and will be alerte environment, will know the and open-source licenses	aw and Informatics o introduce students into the basic legal instruments that they will encounter in their prace ad to the pitfalls that await them in business from the point of view of law. They will under eir responsibilities in working with the Internet, will be familiar with the institutes of intelle . Emphasis will also be put on the legal protection of data on the Internet, the registration in behaviour in the field of IT that can be classified as criminal under the Czech law. The	stand the process ctual property law, n of Internet doma	of concludi , and will be ins and prot	edge of doin ng contracts able to use ection again	s in real and Int commercial lic nst their misuse	ernet ense type: e. Students
	ck: Elective courses of credits of the block: 0 block: V					
Requirement cr	oup: Purely Elective Bachelor Courses, Version 202 <sup>-</sup> edits in the group: ourses in the group:	1				
Note on the gro		encz CSc. e	email <sup>.</sup> rol	oert lore	ncz@fit.cvi	ut cz
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			Semester	Role
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	V
BIE-ZRS	Basics of Systems Control Kate ina Hyniová	Z,ZK	4	2P+2C	L	V
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	3P	L	V
BIE-SCE1	Computer Engineering Seminar I Hana Kubátová, Miroslav Skrbek Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
BIE-SCE2	Computer Engineering Seminar II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	Czech Language for Foreigners Tomáš Houdek, Markéta Hofmannová, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	КZ	2	4C	Z,L	V
BIE-CZ1.21	Czech Language for Foreigners II Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	KZ	2	4C	Z,L	V
UKCJP	<b>Czech language for advanced</b> Tomáš Houdek, Jakub Šenovský, Jakub Šolc, Adam Vostárek <b>Zden k Muziká</b> Zden k Muziká (Gar.)	Z,ZK	2	2BP+2BC	Z,L	V
BIE-EPR	Economic project Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	V
BIE-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	V
BIE-HAS	Human Factors in Cryptography and Security Ivana Trummová	Z,ZK	5	2P+1C	Z	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
BIE-IMA	Introduction to Mathematics Karel Klouda	Z	4	3C	Z	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BIE-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BIE-OOP	Object-Oriented Programming 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 Lukáš Ba inka	Z,ZK	4	2P+2C	L	V
BIE-PRR.21	Project management	Z,ZK	5	2P+2C	Z,L	V

BIE-SKJ.21	Scripting Languages Jan Ž árek, Lukáš Ba inka Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2P+2C	L	v
BIE-VAK.21	Sali Z alek, Lukas Da linka Lukas Da linka Sali Z alek (Gal.) Selected Combinatorics Applications Tomáš Valla, Dušan Knop, Maria Saumell Mendiola, Ond ej Suchý, Šimon Schierreich 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
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVV	Physical education	Z	0	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2K1	Physical Education 2	Z	1		L	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
BIE-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	v
BIE-VR1.21	Virtual reality I Petr Klán Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	v
BIE-ADW.1	Windows Administration           Ji í Kašpar, Miroslav Prágl Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-3DT.1	3D Printing Marek Žehra	KZ	4	3C	L	v
Optional subject Basics be definitely evaluated b control of engineering ar	Basics of Systems Control of System Control is designed for anyone interested in applied computer science in bache yo ur graduates in the industrial practice. Students will gain knowledge in this rapidly evol- nd physical systems. We will provide basic information from the feedback control of linear dear dynamic systems analysis and design verification simple PID feedback PSD and first	elor studies. A brie ving field of great f dynamical SISO s	f introduction uture. We waystems. We	on to the field vill focus our will teach yo	,ZK of automatic attention par	4 c control will ticularly on n methods c
BIE-ZRS Optional subject Basics be definitely evaluated b control of engineering ar system models, basic lin methods of creating a de is also given to sensors	of System Control is designed for anyone interested in applied computer science in bache y our graduates in the industrial practice. Students will gain knowledge in this rapidly evolve	elor studies. A brie ving field of great f dynamical SISO s zy controllers. This cation and simple s adjustment of the	f introductio uture. We v ystems. We is a survey PID feedba	Z on to the field will focus our will teach yo course in wh ck, PSD and parameters a	,ZK of automatic attention par bu description hich students fuzzy control and certain a	4 c control wil ticularly on n methods o s will learn t lers. Attenti spects of th
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This course is all externs	sion of the course introduction to European Economic History (DE-EITD). There is no fixed schedule for DIE-EITR. A teacher	will contact you b	
the semester.			
BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector has been	en deeply transformed in the recent years, which led to a development of structured financial products, a new point of view of	n the issue of crea	dit risk, and
globalization of market a	activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial acti	vities, many firms	need graduates
from technical schools v	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 en	globes both a description of financial markets and related economic theories, and an overview of mathematical and statistica	I tools used in this	s field.
BIE-HAS	Human Factors in Cryptography and Security	Z,ZK	5
This course is for stude	nts interested not only in technical scope of computer science, but also in making products usable - for users and for develop	ers. Students of t	nis course can
use their gained knowle	due to design, plan and analyse their own projects in the context of human-centered security		

	ntroduction to Computer Science	_	2
-	s on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in othe		-
	nts, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The	•	
	of computer science for students to understand, early on, what computer science is, why things such as high-level progra d even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer		
	is about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inte	-	-
than expected, or even les			
BIE-EHD Ir	ntroduction to European Economic History	Z,ZK	3
	election of themes from the European economic history. It gives the student basic knowledge about forming of the global e	I ' I	
of the key periods in histor	y. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econom	nic history. From la	irge economic
area of Roman Empire to f	ragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial inst	titutions is deciphe	ered. The course
	onomic history of particular European countries but rather the impact of trade and role of particular events, institutions and	d organizations in	history. Class
-	nixture of lecture and discussion.		
	ntroduction to Mathematics	Z	4
	nd knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a	ire able to apply th	em in particular
examples.			0
	ntroduction to Mathematics 2	Z	2
	nd knowledge of elementary functions and their properties. Students understand basic mathematical principles and they a	ire able to apply th	iem in particular
examples. BIE-ST1 N	letwork Technology 1	Z	3
	essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad cu	I – I	-
Introduction to Networks.			- Reamp,S
	bject-Oriented Programming	Z,ZK	4
	ing has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate togeth		-
	the main principles of object-oriented programming and design. The emphasis is on practical techniques for software dev		-
handing, refactoring and d	esign patterns.		
BIE-PKM P	reparatory Mathematics	Z	4
	y Mathematics is to help students revise the most important topics of high-school mathematics.		
BIE-PJV P	rogramming in Java	Z,ZK	4
The course Programming	in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Jav	a language the fu	ndamental APIs
will also be presented, esp	ecially data structures, files, GUI, networking, databases and concurrent APIs.		
BIE-PS2	rogramming in shell 2	Z,ZK	4
	erview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In a		
-	d some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmu		
	n very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp,	-	
	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 se	election of advanc	ed scripting
techniques used in practic		774	-
BIE-PRR.21	roject management		
The aim of the course is to	introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork and		5
	introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, an	nalysis, crisis man	agement in a
project, communication, ar	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk	assessment and r	agement in a management,
project, communication, an Gantt charts, resource sch	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk edule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for	alysis, crisis man assessment and r students who are	agement in a management, interested in
project, communication, an Gantt charts, resource sch deepening their knowledge	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk	alysis, crisis man assessment and r students who are	agement in a management, interested in
project, communication, ar Gantt charts, resource sch deepening their knowledge also suitable for all those v	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk edule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for a outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I	halysis, crisis man assessment and r students who are large companies.	agement in a management, interested in
project, communication, ar Gantt charts, resource sch deepening their knowledge also suitable for all those v BIE-SKJ.21	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk edule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for a outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in l who will develop software or hardware in the form of team projects.	asysis, crisis man assessment and r students who are large companies. <sup></sup>	agement in a management, interested in The course is 4
project, communication, ar Gantt charts, resource sch deepening their knowledge also suitable for all those v BIE-SKJ.21 S Students get a general over	gumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk edule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for a outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I who will develop software or hardware in the form of team projects. cripting Languages	alysis, crisis man assessment and r students who are large companies. <sup></sup>	agement in a management, interested in The course is 4 a deeper insight
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	anced ActiveDirectory administration methods. They are able to solve problems by app idents are able to effectively configure centralised administration of a computer networ		troubleshoo	oting metho	ds and adminis	trate
BIE-SEP Wo	orld Economy and Business			2	Z,ZK	4
	ents of technical university to the international business. It does that predominantly by different religions and cultures, necessary for doing business in diverse societies as w				-	-
-	ded for the right investment decision. Seminars help to improve on the knowledge in the					
	urse BIE-SEP as a prerequisite.					
	Printing se-dimensional objects optimized for printing on a RepRap printer and the printing itse	lf. They will be abl	le to desian	obiects, pre	KZ	4 a and print
in 3D.			g	j,	· · · · · · · · · · · · · · ·	9 F
Code of the grou			_			
•	ip: Elective courses originating from neighboring s	pecializatio	ons for	the BI	E-SI, ver.	2021
Requirement cre						
•	rses in the group:					
Credits in the gro	•					
Note on the grou		Ph.D., email	: michal	valenta	@fit.cvut.c	Z
Cada	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their	Completion	Credito	Coore	Comostor	Dala
Code	members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)           Administration of Computer Networks and Services	7 714		00.00	_	
BIE-SPS.21	Libor Dostálek, Jan Kubr <b>Pavel Tvrdík</b> Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2S	Z	V
BIE-AG2	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	V
BIE-TAB.21	Applications of Security in Technology Ji í Dostál Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-ASB.21	Applied Network Security Ji í Dostál <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-APS.1	Architectures of Computer Systems Pavel Tvrdík	Z,ZK	5	2P+2C	Z	V
BIE-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BIE-ZSB.21	Basics of System Security Simona Forn sek, Marián Svetlík Simona Forn sek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-TPS.21	Computer Networks Technologies Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-JPO	Computer Units Pavel Kubalík	Z,ZK	5	2P+2C	Z	V
BIE-VES	Embedded Systems Miroslav Skrbek	Z,ZK	5	2P+2C	L	V
BIE-EHA.21	Ethical Hacking Ji í Dostál, Tomáš Kiezler, Martin Kolárik <b>Ji í Dostál</b> Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-HWB	Hardware Security Ji í Bu ek, Filip Kodýtek, Róbert Lórencz Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-IOT.21	Internet of Things Jan Jane ek, Pavel Tvrdík Jan Jane ek Jan Jane ek (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-UKB.21	Introduction to Cybersecurity Jan B lohoubek, Simona Forn sek, František Ková, Ivana Trummová, David Pokorný, Tomáš Lu ák, Tomáš Rabas <b>Simona Forn sek</b> Róbert Lórencz (Gar.)	Z,ZK	5	3P+1C	z	V
BIE-LA2.21	Linear Algebra 2 Karel Klouda, Marzieh Forough Karel Klouda Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BIE-SIP.21	Network Programming Jan Fesl Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	V
BIE-PNO	Practical Digital Design Martin Novotný	КZ	5	2P+2C	Z	V
BIE-PJP	Programming Languages and Compilers Jan Janoušek	Z,ZK	5	2P+1C	L	V
BIE-SRC.21	Real-time systems Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	V

BIE-BEK	Secure Code Róbert Lórencz	Z,ZK	5	2P+2C	L	V
BIE-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-ADU.1	Unix Administration	Z,ZK	5	2P+2C	L	V
BIE-VDC.21	Virtualization and Data Centers	Z,ZK	5	2P+2C	L	V
BIE-AWD.21	Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.) Web and Database Server Administration	Z,ZK	5	2P+2C	Z	v
	Lukáš Ba inka, Michal Valenta Lukáš Ba inka Michal Valenta (Gar.)					
Characteristics of the specializations for the	e courses of this group of Study Plan: Code=BIE-SI-VO.21 Name ne BIE-SI, ver. 2021	e=Elective co	ourses o	riginating	from ne	eighboring
	dministration of Computer Networks and Services			1	,ZK	5
	deepen the theoretical knowledge of network technologies and protocols in the environm					
with real network infrastruct	urse syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE- ture.	OST. Practical SK	iis wii be ga	amed by prac	lical nanos	on experience
	gorithms and Graphs 2			Z	,ZK	5
	oplications of Security in Technology				,ZK	5
1	introduce students to selected topics from cybersecurity technical applications that are	utilized in differen	nt industries		·	r overview of
cybersecurity applications a	and extend their knowledge from the cryptology, the secure code, and system, network,	and hardware se	curity.			
	oplied Network Security				,ZK	5
	introduce selected topics from computer networks in terms of cybersecurity. These topic		-	-		
	e public key infrastructure, encrypted network protocols, link and network layer security	or wireless netwo	orks. After fil	hishing the c	ourse stude	nt will get
	cations in computer networks. rchitectures of Computer Systems			7	,ZK	5
	struction principles of computer Systems	level of machine	instructions		· I	-
	sing and on the memory hierarchy. Students will understand the basic concepts of RISC					
	s, but also in superscalar processors that can execute multiple instructions in one cycle,					
The course further elaborat	es the principles and architectures of shared memory multiprocessor and multicore syst	tems and the mer	nory cohere	ence and cor	nsistency in	such systems.
1	rtificial Intelligence Fundamentals			1	,ZK	5
	the fundamental problems in the Artificial Intelligence, and the basic methods for their sol	-	-			
	systems, game theory, planning, and machine learning. Modern soft-computing methods	, including the ev	olutionary a	lgorithms an	d the neura	l networks, will
be presented as well. BIE-ZRS.21 Ba	asics of System Control			7	,ZK	5
	action to the field of automatic control. It focuses particularly on the control of engineerin	in and physical sy	stems It co		·	-
-	single-input-single-output systems. Students will learn the methods of creating description				-	
design and verification of si	mple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and ac	tuators in control	loops, issue	es of stability	of control s	ystems, single
· · · ·	of the controller parameters, and certain aspects of the industrial implementations of co	ontinuous and dig	ital controlle	ers.		
	asics of System Security			1	,ZK	5
-	provide introduction to basic concepts in security of computer systems. Further, the cou				-	
	or incident response. After finishing the course student will get both theoretical and pract independent work in the area of operating system security incident analysis.	lical knowledge in	the area o	r modern ope	erating syste	ems security,
	omputer Networks Technologies			7	,ZK	5
	ents with basic and advanced technologies, components, and interfaces of contemporal	ry computer netw	orks at the			-
link layer. The lectures provi	ide theoretical foundations of these technologies and explain relevant physical principles	s. In the labs, the	respective	technologies	will be den	onstrated and
	es students will get hands-on experience. Thematically, the course covers both local and	I long-range optic	al networks	, Ethernet, n	nodern wire	ess networks,
always with focus on high-s	· · · · · · · · · · · · · · · · · · ·					
	omputer Units		ant Thay un		,ZK	5
	structure and organization of computer or processor components and their interfacing w memories (addressable, LIFO, FIFO and CAM). They know the organization of an arithm		-		-	
	principles of communication with peripheral devices and buses. They understand the a	-		igninouo	logy for our	
	mbedded Systems			Z	,ZK	5
	bedded systems and develop software for them. They get basic knowledge of the most co	ommon microcon	trollers and			
peripheral circuits, program	ming methods, and applications. They get practical skills with development kits and tool	S.				
BIE-EHA.21 Et	hical Hacking			Z	,ZK	5
-	introduce students to the field of penetration testing and ethical hacking. The course de	-	-			-
	tworks, web applications, wireless networks, operating systems, and others like the Inter ne following process of penetration test documentation.	rnet of Things or	cloud. The f	ocus is on ha	ands-on exp	erience with
	ardware Security			7	,ZK	5
1	ware resources used to ensure security of computer systems including embedded ones	. The students be	come famil		· I	
	security features of modern processors, and storage media protection through encryptic					-
including side-channel attac	cks and tampering with hardware during manufacture. Students will have an overview of c	ontact and contac	ctless smart	card techno	logy includi	ng applications
	factor authentication (biometrics). Students will understand the problems of effective imp	plementation of c	phers.			
	ternet of Things	(I- <b>T</b> )   · ·			,ZK	5
	verview of technologies and development tools used in the field of the Internet of Things ( chnologies designed primarily for this area, and appropriate programming methods. The					
	labs, students will gain practical experience with developing simple IoT systems using c					
software - Arduino, Raspbe				(nare		,, <b>_</b> _, <b>,</b>
	troduction to Cybersecurity			Z	,ZK	5
	provide students with the introduction of basic concepts in modern approach to cyberse	ecurity. Students	will get a ba			n cyberspace
and attacker techniques, se	curity mechanisms in networks, operating systems and applications, as well as of basic	cyberspace regu	lations.			

BIE-LA2.21 Linear Algebra 2	Z,ZK	5
Students will broaden their knowledge gained in the BIE-LA1 introductory course, where only vectors in the form of n-tuples of numbers were considered	ered. Here we will	introduce vector
spaces in a general abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear alge		•
graphics. The other main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The iss	sues of numerical	linear algebra
will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be presented.		
BIE-LOG.21 Mathematical Logic	Z,ZK	5
The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiad	bility, logical equivation	alence, and the
logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, a	are explained. This	relates to the P
vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, an	d their models. Th	e syntactic
approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems	is explained.	
BIE-MPP.21 Methods of interfacing peripheral devices	Z,ZK	5
The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universe is focused on Universe is focused on techniques based on Universe is focused on Universe is focused on techniques based on Universe is focused on Universe is foc	ersal serial bus (U	SB). The course
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of L	JSB devices, Linu	x and Windows
drivers, simple application development, and APIs of selected devices.		
BIE-SIP.21 Network Programming	Z	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level prog	ramming using BS	3D sockets. The
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middle	eware technologie	es. The final part
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in co	omputer labs using	g a chosen
programming language environment.		
BIE-PNO Practical Digital Design	KZ	5
Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand t	the basics of the V	-
and implementation technologies FPGA and ASIC.		0 0 /
BIE-PJP Programming Languages and Compilers	Z.ZK	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implement	I ' I	÷
for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that h		
form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages,		° °
for parsing and processing text in a language defined by a LL(1) grammar.		earer programe
BIE-SRC.21 Real-time systems	Z,ZK	5
Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue		-
lectures will be experimentally verified in department specialized labs. The course is mainly focused on embedded RT systems, therefore the design		-
the BIE-VES course and FPGAs.		
BIE-BEK Secure Code	Z,ZK	5
The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting		
theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every	•	5
administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securin		
security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	•	·
BIE-VPS.21 Selected Topics in Computer Networking	Z,ZK	5
The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and techn	1 1	-
networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practi		•
devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and securit		Treathetwork
	Z,ZK	5
BIE-ADU.1 Unix Administration		
BIE-VDC.21 Virtualization and Data Centers	Z,ZK	5
The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design a		
infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of	•	·
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications		
design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outa	-	
BIE-AWD.21 Web and Database Server Administration	Z,ZK	5
Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a		ex database and
web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of	a web server.	

## List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Co	nputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	b 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	rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	rs. The topics are n	ew for each
	semester.		
BIE-3DT.1	3D Printing	KZ	4
Students learn to o	esign three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects	, prepare for printir	ng and print
	in 3D.		
BIE-AAG.21	Automata and Grammars	Z,ZK	5
Students are introd	uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	automata, regular	expressions
and regular gramm	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between fo	rmal languages an	d automata.
Knowledge acqui	ed 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
	stand 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	and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adm	inistrate
	heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.	7 71/	<i></i>
BIE-AG1.21	Algorithms and Graphs 1 s the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computi	Z,ZK	5 interlinked
	t BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of a	-	
	practically the asymptotic mathematics.	5	
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-APS.1	Architectures of Computer Systems	Z,ZK	5
Students will lea	rn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec		en on the
	on 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		
BIE-ASB.21	Applied Network Security urse is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gaine		5 with actual
	tions like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing		
	knowledge of security applications in computer networks.		5-1
BIE-AWD.21	Web and Database Server Administration	Z,ZK	5
Students will get a	cquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and l	backup complex da	tabase and
web serv	vice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an examination of the principles will be used as an examination of the principle states and the principle states are as a state of the principle states are as a state as a state of the principle states are as	ple of a web serve	er.
BIE-BAP.21	Bachelor Thesis	Z	14
BIE-BEK	Secure Code	Z,ZK	5
	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		-
	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		
	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the		-
BIE-BPR.21	Bachelor Project	Z	1
	of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that si	- 1	
	semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.	·	Ū
BIE-CCN	Compiler Construction	Z,ZK	5
This is an introd	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for st	udents to
	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class	
BIE-CSI	Introduction to Computer Science	Z	2
	tory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other file		-
-	ool students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go principles of computer science for students to understand, early on, what computer science is, why things such as high-level programme		
	y are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no		
	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interest		
	than expected, or even less than before.		
BIE-CZ0	Czech Language for Foreigners	KZ	2
	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time		
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2
	ended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The		pands the
BIE-DBS.21	c vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the		5
	Database Systems ainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (i	Z,ZK	
	I model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its theoret		-
	et acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction pro		
	user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database m	nodels.	
BIE-DML.21	Discrete Mathematics and Logic	Z,ZK	5
-	cquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts fro	-	-
Special attention is	s paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The cours combinatorics and number theory, with emphasis on modular arithmetics.	e also lays down th	ne basics of
BIE-EEC		7	4
	English language external certificate se can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Engli	← sh comparable to o	
	the B2 level of the Common European Framework of Reference for Languages.		
BIE-EHA.21	Ethical Hacking	Z,ZK	5
The goal of the c	ourse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln	erabilities, and thei	r possible
exploitation in cor	nputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is	on hands-on expe	rience with
	vulnerabilities testing and the following process of penetration test documentation.		
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 s in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic		-
	sin history. As European countries have been dominant actors in this process it locuses predominantly on their roles in the economic appre to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial instituti		
	etailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and c	•	
	meetings will consist of a mixture of lecture and discussion.		
BIE-EPP.21	meetings will consist of a mixture of lecture and discussion.		
The aim of the cou	Economic Business Processes	Z,ZK	5
	Economic Business Processes Irse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and	financial aspects	of business
in the market envi	Economic Business Processes urse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and ronment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the	financial aspects company's life cycl	of business e, from the
in the market envi	Economic Business Processes Irse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and	financial aspects company's life cycl	of business e, from the

BIE-EPR	Economic project	Z	1
This course is an e	xtension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will	contact you before	the start of
	the semester.		
BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector	has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on	the issue of credit	risk, and
-	rket activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activitie	-	-
	nools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of fin		
	se thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistic		
BIE-GIT.21	SW Development Technologies ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to	Cit. the information	3
	from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use		manayei
BIE-HAS	Human Factors in Cryptography and Security	Z,ZK	5
	students interested not only in technical scope of computer science, but also in making products usable - for users and for developers		
	use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security.		
BIE-HWB	Hardware Security	Z,ZK	5
The course deal	s with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar wit	h the operating pri	nciples of
	ules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about vi		
including side-char	nnel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card tec		applications
	and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of		
BIE-IDO.21	Introduction to DevOps	Z,ZK	5
	vith the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systop support software development, testing and compilation. It also focuses on tools for automating infrastructure management and build		
	introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquaint		
	used in practice.		intelegiee
BIE-IMA	Introduction to Mathematics	Z	4
	nd extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a	ble to apply them i	n particular
	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 a	ble to apply them i	n particular
	examples.		
BIE-IOT.21	Internet of Things	Z,ZK	5
	s on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an over		
	ication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architec		
	computer labs, students will gain practical experience with developing simple IoT systems using common development environments software - Arduino, Raspberry Pi OS).	(Ilaluwale - Arivi,	ESF, STIVI,
BIE- IPO		7 7K	5
BIE-JPO Students know tl	Computer Units	Z,ZK	5 n of main
Students know th		and the organizatio	n of main
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Students know th	Computer Units ne internal structure and organization of computer or processor components and their interfacing with the environment. They understar internal memories (addressable, LIFO, FIFO and CAM). They know the organization of an arithmetic unit. They learn the design met	and the organizatio	n of main
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	Mathematical Analysis 2	Z,ZK	6
The course comple	etes the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students will I	earn how to integra	ate by parts
	ution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylor's theorem to	-	-
	escribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, ar		
-	we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and I		-
-	f localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integ	ration of multivaria	te functions.
BIE-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
The course is focus	ed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universit	al serial bus (USB).	The course
includes both PC s	side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USI	B devices, Linux ar	nd Windows
	drivers, simple application development, and APIs of selected devices.		
BIE-OOP	Object-Oriented Programming	Z,ZK	4
Object-oriented p	rogramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	r by message pass	ing. In this
course we look at	some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software develo	opment including te	sting, error
	handing, refactoring and design patterns.		
BIE-OOP.21	Object-Oriented Programming	Z,ZK	5
	rogramming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together		-
course students ge	t acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The empl	nasis is on practica	l techniques
	for developing software, which includes testing, error handing, refactoring, and application of design pattern.		
BIE-OSY.21	Operating Systems	Z,ZK	5
In this course that is	a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread im	plementations, race	e conditions,
critical regions, thre	ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS mon	itoring. They are ab	le to design
	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W	/indows.	
BIE-PA1.21	Programming and Algorithmics 1	Z,ZK	7
Students learn to	construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structur	ed), expressions, s	tatements,
and functions pre	esented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundamer	tal algorithms for s	earching,
	sorting, and manipulating linked lists and trees.		
BIE-PA2.21	Programming and Algorithmics 2	Z,ZK	7
Students know the	instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	eue, enlargeable ar	ray, list, set,
table). They lear	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (	e.g., template prog	ramming,
	copying/moving of objects, operator overloading, inheritance, polymorphism).		
BIE-PAI.21	Law and Informatics	ZK	5
The aim of the co	urse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge o	f doing business in	the Czech
Republic and wi	ill be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding or	ontracts in real and	Internet
environment, will k	now their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to	use commercial lic	cense types
	icenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	against their misus	e Students
بمام ممام الأسب			
will also be alei	rted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses	of real cases from p	
BIE-PJP	ted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses on Programming Languages and Compilers	of real cases from p	
BIE-PJP		Z,ZK	oractice. 5
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	Probability and Statistics	Z,ZK	5
	the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. T		
	om variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	-	-
esumations of uni	known distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statistical the statistical dependence of two or more random variables.	i nypotneses and d	etermining
BIE-SAP.21	Computer Structures and Architectures	Z,ZK	5
	and basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, input		-
	r. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern of	-	-
BIE-SCE1	Computer Engineering Seminar I	Z	4
	mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	-	
	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		
articles and other	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	rs. The topics are n	ew for each
	semester.		
BIE-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Co	mputer Engineering is a (s) elective course for students who want to deal with deeper topics of digital design, reliability and resistance to	o failures and attack	ks. Students
	idividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	-	
articles and other p	professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	rs. The topics are n	ew for each
	semester.		
BIE-SEG	Systems Engineering	Z	0
	tory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of c		
	cessor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor		
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.	icurrency is, as opp	poseu io
BIE-SEP	World Economy and Business	Z,ZK	4
	uces students of technical university to the international business. It does that predominantly by comparing individual countries and k	· · ·	
	know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom		
J J	the reneeded for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indiv		
	take bachelor level of this course BIE-SEP as a prerequisite.	iddai i oddinigor it io	
BIE-SIP.21	Network Programming	7	5
	fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level program	nming using BSD s	-
	oted to designing communication protocols and their verification. The third part introduces the principles and applications of middlewa		
	c modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in con		
	programming language environment.		
BIE-SKJ.21	Scripting Languages	Z,ZK	4
Students get a ger	heral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit	ion, they gain a dee	eper insight
into Bourne Again	shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus st	udents: We are rea	dy do adapt
the lectures to pro	wide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, In,	mkdir rm ) and u	
data filtering too	Is (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a sel		
	Is (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selected techniques used in practice.	ection of advanced	l scripting
BIE-SP1.21	Is (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selected techniques used in practice. Team Software Project 1	ection of advanced	l scripting 5
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BIE-SP1.21 Students gain h concurrently and t project leader, reg BIE-SP2.21 Students gain hand However, in this t teach BIE-SPS.21 The aim of the cou Linux and Windows BIE-SPS.21 Students obtain t lectures will be exp BIE-SRC.21 Students obtain t lectures will be exp BIE-ST1 The course is for BIE-SWI.21 Students get acqui their knowledge du using the visual la st BIE-TAB.21 The goal of the cou BIE-TDP.21 The course is focu- learn to create text	Is (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selectioniques used in practice. Team Software Project 1 ands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the hat teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The teach ularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software art and finished in the BIE-SP2 course. Team Software Project 2 ds-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result ollow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work in a material aspects of the software are used in a theoretical knowledge of network technologies and protocols in the environment of network servers administrate es. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIC-SY. Practical skills will be gained by with real network infrastructure. Real-time systems Real-time systems Real-time systems including the dependability issues berimentally verified in department specialized labs. The course is mainly focused on embedded RT systems, therefore the design kit the BIE-VES course and FPGAs. Software Engineering ainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They co tring the analysis and design of larger software projects that are typically designed and implemented in teams. They co tring the analysis and design of larger software projects that are typically designed and implemented in teams. They co tring the analysis and design of larger software projects that are typically designed and implemented in teams. They co tring the analys	ection of advanced           KZ           e BIE-SWI course t           er, in the role of the           effact will be further           KZ           of the BIE-SP1 course           in teams of 4-6 perse           s of their solution.           Z,ZK           d under the operati           practical hands-on           Z,ZK           in the ab are the           Z,ZK           nation the lab are the           Z,ZK           nsolidate and praction           and testing. Within t           development.           Z,ZK           int s get a broader of security.           KZ           nal university these           int in front of class	I scripting 5 that runs e team and r developed 5 urse project. eople. The 5 ing systems experience 5 edge from same as in 3 R&S 5 tically verify CASE tools the course, 5 overview of 3 as. Students smates and

	love Technology	771	F
BIE-TJV.21	Java Technology	Z,ZK	5
	irse is to provide knowledge and skills needed for the development of smaller and larger information systems. Students will get acqua	-	
concepts and will	be able to apply these concepts using libraries and tools from the ecosystem of the Java programming language. After completing th	e course students	will be able
to participate in	the development of software systems on the Java platform. Students are assumed to be acquainted with the following topics (they are	e used and not taug	ght in this
	course): Java language syntax, SQL, git version control system, Docker, continuous integration.		
BIE-TPS.21	Computer Networks Technologies	Z,ZK	5
			1
	uces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physica	-	-
link layer. The lectu	rres provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technolo	gies will be demor	nstrated and
with the most impo	rtant ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethern	et, modern wireles	s networks,
	always with focus on high-speed networks.		
		Z,ZK	5
BIE-TUR.21	User Interface Design	· · ·	-
Students gain a b	asic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where softwa	are and other produ	ucts do not
communicate with	the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gai	n an overview of m	ethods that
	bring users into the development process to ensure optimal interface for them.		
BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	$\mathbf{v}$		-
	ainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer s		
level. They are intr	oduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to redu	ice the consumptio	on; what the
limits to the maxim	num operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a con	nputer power suppl	ly looks like
	(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.		
		7.71/	F
BIE-UKB.21	Introduction to Cybersecurity	Z,ZK	5
The goal of the co	urse is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic ove	rview of threats in o	cyberspace
	and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace reg	gulations.	
BIE-UOS.21	Unix-like Operating Systems	KZ	5
	systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative fu	1	-
	uters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic proper		
processes and three	eads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of	of advanced users	who are not
only able	e to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting in	terface, called she	II.
BIE-VAK.21	Selected Combinatorics Applications	Z	3
		. – .	-
	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the b		
	ions to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic		
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	ormatics. Areas from	m which we
will select probler	ns to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimiz	ation and more. St	udents will
	also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.		
			-
BIE-VDC.21	Virtualization and Data Centers	Z,ZK	5
The aim of the cou	rse is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and	implementation of	data center
infrastructure, suc	h as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data cer	nter technologies fr	om private
to public and hyb	rid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications.	Students will unde	rstand the
	ation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, o		
BIE-VES	Embedded Systems	Z,ZK	5
Students learn to d	esign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedd	led processors, the	ir integrated
	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
BIE-VPS.21		Z,ZK	5
	Selected Topics in Computer Networking		-
	ipon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technology		
networks from loc	al area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical	experience with re	eal network
de	vices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance	<ol> <li>and security.</li> </ol>	
BIE-VR1.21	Virtual reality I	KZ	4
		1	1
Introduction to Vir	tual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The c		ne ways of
	creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social	activities.	
BIE-ZRS	Basics of Systems Control	Z,ZK	4
	Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the		1
	lated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focu		
control of enginee	ring and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will tea	ch you description	methods of
system models, ba	sic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course	in which students v	vill learn the
methods of creating	g a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD	and fuzzy controlle	rs. Attention
	nsors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller paramet	-	
-		-	
	nentation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful exam	pies and practical	industrial
	implementations.		
BIE-ZRS.21	Basics of System Control	Z,ZK	5
The course gives a	n introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It covers ba	sic knowledge of th	ne feedback
-	namical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear d	-	
	tion of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of sta		
-			terns, single
a	d continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digita	al controllers.	
BIE-ZSB.21	Basics of System Security	Z,ZK	5
	urse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forens	1 1	ated topics
-	analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder	-	-
Such as manwale		oporating system	
	as well as skills needed for independent work in the area of operating system security incident analysis.		1
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introc	uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic	al tasks from the ar	reas of state
	i-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm		
	be presented as well.		,

BIE-ZUM.2	Artificial Intelligence Fundamentals	Z,ZK	5
Students are int	oduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic	al tasks from the a	reas of state
space search, m	ulti-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm	s and the neural n	etworks, will
	be presented as well.		
TV2K1	Physical Education 2	Z	1
TVKLV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
UKCJP	Czech language for advanced	Z,ZK	2
	An advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with vali	dity for CTU.	

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2024-05-17, time 13:06.