### Recomended pass through the study plan

#### Name of the pass: Bachelor specialization, Computer Engineering, 2021

Faculty/Institute/Others:

Department:

Pass through the study plan: Bachelor Specialization Computer Engineering, 2021

Branch of study guranteed by the department: Welcome page

Guarantor of the study branch: Program of study: Informatics Type of study: Bachelor full-time

Note on the pass: In addition to purely elective courses, compulsory courses in neighboring specializations can also be enrolled here as electives. The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding the B2 level of the Common European Framework of Reference for Languages.

Coding of roles of courses and groups of courses:

P - compulsory courses of the program, PO - compulsory courses of the branch, Z - compulsory courses, S - compulsory elective courses, PV - compulsory elective courses, F - elective specialized courses, V - elective courses, T - physical training courses

Coding of ways of completion of courses (KZ/Z/ZK) and coding of semesters (Z/L):

KZ - graded assesment, Z - assesment, ZK - examination, L - summer semester, Z - winter semester

#### Number of semester: 1

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-DML.21	Discrete Mathematics and Logic Eva Pernecká, Jitka Rybníčková, Francesco Dolce Eva Pernecká Eva Pernecká (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-LA1.21	Linear Algebra 1 Marzieh Forough Karel Klouda Marzieh Forough (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-PA1.21	Programming and Algorithmics 1 Jan Trávníček, Ladislav Vagner, Radek Hušek, Josef Vogel Jan Trávníček Jan Trávníček (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BIE-GIT.21	SW Development Technologies Petr Pulc Petr Pulc (Gar.)	Z	3	2P	Z	PP
BIE-TZP.21	Technological Fundamentals of Computers Martin Novotný, Kateřina Hyniová, Matúš Olekšák <b>Martin Novotný</b> Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-UOS.21	Unix-like Operating Systems Jan Trdlička, Zdeněk Muzikář, Jakub Žitný Zdeněk Muzikář Zdeněk Muzikář (Gar.)	KZ	5	2P+2C	Z	PP

#### Number of semester: 2

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-SAP.21	Computer Structures and Architectures Petr Fišer, Hana Kubátová Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BIE-DBS.21	Database Systems Josef Pavlíček, Otto Šleger, Martin Urbanec Josef Pavlíček Josef Pavlíček (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BIE-MA1.21	Mathematical Analysis 1 Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-PA2.21	Programming and Algorithmics 2  Jan Trávníček, Ladislav Vagner, Radek Hušek, Josef Vogel Jan Trávníček  Jan Trávníček (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BIE-LA2.21	Linear Algebra 2 Marzieh Forough, Karel Klouda Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	PS
BIE-V.2021	Purely Elective Bachelor Courses, Version 2021 till 2024/25 BIE-ZUM, BIE-ZRS, (see the list of groups below)	Min. cours. 0 Max. cours. 15	Min/Max 0/55			V

# Number of semester: 3

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 Radek Hušek, Tomáš Valla, Ondřej Suchý, Michal Opler, Dušan Knop, Jan Volec <b>Dušan Knop</b> Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-AAG.21	Automata and Grammars Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-MA2.21	Mathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)	Z,ZK	6	3P+2C	Z	PP
BIE-APS.21	Architectures of Computer Systems Pavel Tvrdík, Michal Štepanovský Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	PS
		Min. cours.				
DIE MOSS	Purely Elective Bachelor Courses, Version 2021 till 2024/25	0	Min/Max			
BIE-V.2021	BIE-ZUM,BIE-ZRS, (see the list of groups below)	Max. cours.	0/55			V
		15				

# Number of semester: 4

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-PSI.21	Computer Networks Yelena Trofimova, Michal Polák <b>Yelena Trofimova</b> Yelena Trofimova (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-KAB.21	Cryptography and Security František Kovář, Ivana Trummová, Róbert Lórencz, Jiří Buček, Josef Kokeš, Martin Jureček, Jaroslav Kříž, David Pokorný, Filip Kodýtek <b>Jiří Buček</b> Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BIE-OSY.21	Operating Systems Jan Trdlička, Pavel Tvrdík, Michal Štepanovský Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1R+1L	. L	PP
BIE-ZRS.21	Basics of System Control Kateřina Hyniová Kateřina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z,L	PS
BIE-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	PS
BIE-PI-PV.21	Compulsory elective Courses of Specialization Computer Engineering, version 2021  BIE-ZUM.21,BIE-PJP, (see the list of groups below)	Min. cours.  1 Max. cours.	Min/Max 5/15			PV

## Number of semester: 5

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-BPR.21	Bachelor Project Zdeněk Muzikář Zdeněk Muzikář (Gar.)	Z	1		Z,L	PP
BIE-PST.21	Probability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-PNO.21	Practical Digital Design  Martin Novotný	KZ	5	2P+2C	Z	PS
BIE-SRC.21	Real-time systems Hana Kubátová, Jiří Vyskočil Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	PS
		Min. cours.				
BIE-V.2021	Purely Elective Bachelor Courses, Version 2021 till 2024/25	0	Min/Max			
	BIE-ZUM,BIE-ZRS, (see the list of groups below)	Max. cours.	0/55			V
		15				

Number of semester: 6

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-BAP.21	Bachelor Thesis Zdeněk Muzikář <b>Zdeněk Muziká</b> ř Zdeněk Muzikář (Gar.)	Z	14		L,Z	PP
BIE-TDP.21	Documentation and Presentation Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BIE-EEC	English language external certificate Zdeněk Muzikář <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z	4	2D	L	PP
		Min. cours.				
BIE-V.2021	Purely Elective Bachelor Courses, Version 2021 till 2024/25 BIE-ZUM,BIE-ZRS, (see the list of groups below)	0	Min/Max			V
		Max. cours.	0/55			V
		15				

# List of groups of courses of this pass with the complete content of members of individual groups

Kód		Name of the group group (for specifical	of courses and tion see here	d codes of members of this or below the list of courses)	Com	pletion	Credit	s Scope	Semester	Role
BIE-PI-	PV.21	Compulsory electi En	ve Courses of gineering, ver	Specialization Computer sion 2021		cours. 1 . cours. 3	<b>Min/M</b> a 5/15			PV
BIE-ZUM.21	Artificial In	telligence Fundamen	BIE-PJP	Programming Languages and Com	ıpil	BIE-BEK		Secure Code		
BIE-V.	2021	Purely Elective Bad	chelor Course	s, Version 2021 till 2024/25		cours. 0 . cours.	<b>Min/M</b> a			V
	I a see a see					15				
BIE-ZUM		telligence Fundamen	BIE-ZRS	Basics of Systems Control		BIE-CCN		Compiler Con		
BIE-SCE1		Engineering Seminar I	BIE-SCE2	Computer Engineering Seminar II		BIE-CZ0			age for Foreign	ers
BIE-CZ1.21 BIE-EPR		guage for Foreigners II	UKCJP BIE-FTR.1	Czech language for advanced		BIE-DIF		Differential eq		
BIE-EPH BIE-CSI	Economic	project n to Computer Science	BIE-FTR.1	Financial Markets		FITE-EH			s in Cryptograp	
BIE-IMA		n to Mathematics	BIE-EHD BIE-IMA2	Introduction to European Economi Introduction to Mathematics 2	•••	BIE-ST1		Network Tech	European Eco	morni
BIE-IIVIA		y Mathematics	BIE-IIVIA2	Programming in Java		BIE-S11		Programming	37	
FIT-ACM1	<u> </u>	ing Practices 1	FIT-ACM2	Programming Practices 2		FIT-ACM		Programming Programming		
FIT-ACM1		ing Practices 1	FIT-ACM2	Programming Practices 5		FIT-ACM	-	Programming		
BIE-PRR.21	Project ma	<u> </u>	BIE-SKJ.21	Scripting Languages		BIE-VAK	-			icati
BIE-VMM		lathematical Methods	BI-SCE1	Computer Engineering Seminar I		BIE-SEG		Selected Combinatorics Applicati Systems Engineering		
TVV	Physical ed		TVV0	Physical education		TV2K1		Physical Educ		
TVKLV		ducation Course	BIE-TUR.21	User Interface Design		BIE-VR1		Virtual reality		
BIE-ADW.1	,	Administration	FITE-SEP	World Economy and Business		BIE-SEP		World Economy and Business		
BIE-3DT.1	3D Printing		1			_ ·· <del>-</del> -·			,	-

### List of courses of this pass:

Code	Name of the course	Completion	Credits					
BI-SCE1	Computer Engineering Seminar I	Z	4					
The Seminar of Cor	The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students							
are approached in	dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the	subject is work wit	th scientific					
articles and other p	rofessional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher	s. The topics are n	ew for each					
	semester.							
BIE-3DT.1	3D Printing	KZ	4					
Students learn to d	lesign three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects.	prepare for printing	g and print					
	in 3D.							
BIE-AAG.21	Automata and Grammars	Z,ZK	5					
Students are introd	Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions							
and regular gramm	and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata.							
Knowledge acquir	red through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,	and design of digit	al circuits.					

BIE-ADW.1 Windows Administration Z,ZK Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network. BIE-AG1.21 Algorithms and Graphs 1 Z,ZK The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It 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 learn to handle practically the asymptotic mathematics. BIE-APS.21 Architectures of Computer Systems Z,ZK Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such systems. BIE-BAP.21 **Bachelor Thesis** Z 14 **BIE-BEK** Z,ZK 5 Secure Code The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them. BIE-BPR.21 **Bachelor Project** 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 perform during the semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course. **BIE-CCN** Compiler Construction 5 Z.ZK This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class. Introduction to Computer Science This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fields but interested in computer science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The goal of the class is to introduce and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level programming languages and tools are done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected, or even less than before. BIE-CZ0 Czech Language for Foreigners K7 2 Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family. BIE-CZ1.21 Czech Language for Foreigners II 2 ΚZ The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The course further expands the basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Republic. BIE-DBS.21 **Database Systems** 7.7K Students get acquainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (including integrity constraints) using a conceptual model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its theoretical basis - relational database model. They will get acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction processing and control 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-DIF** Differential equations This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential solution methods like separation of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with methods like characteristic polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applications. Finally, an introduction to partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and PDEs, including implicit and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. BIE-DML.21 Discrete Mathematics and Logic Z,ZK 5 Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics. **BIE-EEC** English language external certificate 4 The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding the B2 level of the Common European Framework of Reference for Languages. Introduction to European Economic History The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion. BIE-EPR Economic project Z 1 This course is an extension 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 Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.

BIE-GIT.21 This course is aim	SW Development Technologies  ed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use		3 on manager
BIE-HAS This course is for	Human Factors in Cryptography and Security 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.	Z,ZK	5 course can
		7	4
BIE-IMA Students refresh a	Introduction to Mathematics and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a examples.	Z ble to apply them	4 in particular
BIE-IMA2	Introduction to Mathematics 2	Z	2
	and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a examples.		
BIE-JPO.21	Computer Units	Z,ZK	5
	their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail w		ucture and
organization of cor	nputer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate units and using a propriate units and units a propriate units and using a propriate u	riate codes for imp	lementation
of multiplication. The	ne organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including	codes for error de	etection and
	llel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of commund the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microproand and programmable hardware design kits (FPGA).		
BIE-KAB.21	Cryptography and Security	Z,ZK	5
	derstand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to	,	
certificates in syst	ems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in appli	cations. Within lab	s, students
will gain practical	skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.	f cryptanalysis. St	udents are
BIE-LA1.21	Linear Algebra 1	Z,ZK	5
We will introduce	students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field	of real and comple	x numbers
	e fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian eliminate	-	
the connection v	vith linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenv matrix. We will also demonstrate some applications of these concepts in computer science.	alues and eigenve	ectors of a
BIE-LA2.21	Linear Algebra 2	Z,ZK	5
	then their knowledge gained in the BIE-LA1 introductory course, where only vectors in the form of n-tuples of numbers were considered	,	
spaces in a gen	eral abstract form. The notions of a scalar product and a linear map will enable to demonstrate the profound link between linear algebrase.	ra, geometry, and	computer
graphics. The oth	er main topic will be numerical linear algebra, in particular problems with solving systems of linear equations on computers. The issue		ar algebra
	will be demonstrated mainly on the matrix factorization problem. Selected applications of linear algebra in various fields will be pre		
BIE-MA1.21	Mathematical Analysis 1	Z,ZK	5
	se by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. I of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of function.	=	
	or a real variable. We gradually introduce the honors of limits of sequences and functions, continuous functions, and derivatives of functions of the following problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and		
	issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical descripti		-
BIE-MA2.21	Mathematical Analysis 2	Z,ZK	6
The course comp	letes the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students will le	arn how to integra	ite by parts
	tution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to		- 1
•	escribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and the study that the theory of multiprints functions. After establishing basic appears of multiprints and the study of the study o		
analytical method	we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and Hof localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integral descent method.	ation of multivaria	te functions.
BIE-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
	sed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USE		
molades both i o	drivers, simple application development, and APIs of selected devices.	devices, Elliax al	ia vviilaows
BIE-OSY.21	Operating Systems	Z,ZK	5
	s a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread imp		
critical regions, thr	ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monit and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Wi		le to design
BIE-PA1.21	Programming and Algorithmics 1	Z,ZK	7
	construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structure		
	resented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundament sorting, and manipulating linked lists and trees.		I
BIE-PA2.21	Programming and Algorithmics 2	Z,ZK	7
	instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	_	-
table). They lear	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e copying/moving of objects, operator overloading, inheritance, polymorphism).	.g., template prog	ramming,
BIE-PJP	Programming Languages and Compilers	Z,ZK	5
	asic methods of implementation of common high-level programming languages. They get experience with the design and implementati		
	amming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has	=	- 1
ioriii and write a co	ompiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but for parsing and processing text in a language defined by a LL(1) grammar.	exterios to all othe	er programs
BIE-PJV	Programming in Java	Z,ZK	4
	mming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java la		
	will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.		
BIE-PKM	Preparatory Mathematics  The purpose of Proparatory Mathematics is to help students revise the most important topics of high school mathematics	Z	4
	The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.		

BIE-PNO.21 Practical Digital Design ΚZ 5 Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern industry-standard CAD design tools. BIE-PRR.21 Project management Z,ZK The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects. BIE-PS2 Programming in shell 2 Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: We are ready do adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (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 selection of advanced scripting techniques used in practice. Computer Networks BIE-PSI.21 The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. Probability and Statistics Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able 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 statistical hypotheses and determining the statistical dependence of two or more random variables. BIE-SAP.21 Computer Structures and Architectures Z,ZK 5 Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools BIF-SCF1 Computer Engineering Seminar I The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. BIE-SCE2 Computer Engineering Seminar II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each **BIE-SEG** Systems Engineering Ζ This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of operating systems for students to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the class, students are able to understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concurrency is, as opposed to parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. **BIE-SEP** World Economy and Business 7 7K The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite. Scripting Languages Join us on a tour into the world of scripted programming. Together, we will unveil the power of Bourne Again shell and PERL as proven industry standards, as well as a couple of other standard text processing utilities (AWK, sed), with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. We will provide a general overview of scripting languages and introduction into their pros and cons and students get practical experience with shell script programming. We will touch also ROFF, PerlDoc, and even TeX to get some insight into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you advanced programming techniques and tricks that get overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the scripting world. Lukáš is a renowned lecturer in advanced shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whose code contributes to safe and streamline operations of cloud service datacenters around the globe. BIE-SRC.21 Real-time systems Z,ZK Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in department specialized labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are the same as in the BIE-VES course and FPGAs. BIE-ST1 Network Technology 1 Ζ 3 The course is focused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad curriculum, CCNA1 - R&S Introduction to Networks. BIE-TDP.21 **Documentation and Presentation** The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically final university theses. Students learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present 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 14 days of teaching. Within the exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed. BIE-TUR.21 Z.ZK User Interface Design Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them.

BIE-TZP.21	Technological Fundamentals of Computers	Z,ZK	5
	nted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer st		
	duced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to redu Im operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a com		
mino to the maxim	(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.	ipator potror cuppi	y looko iiko
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 full	nctions of multiuse	r operating
	tters and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic propert		-
	ads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level o to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting in		
BIE-VAK.21	Selected Combinatorics Applications	Z	3
l l	introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the ba		_
	ons to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic	•	
•	cipation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) info		
will select problem	s to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimized also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.	ation and more. Stu	idents will
BIE-VES.21	Embedded Systems	Z.ZK	5
	sign embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedd	, ,	-
	peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.	•	ŭ
BIE-VMM	Selected Mathematical Methods	Z,ZK	4
_	with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then add		
	we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wa		e examine
BIE-VR1.21	e linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interestin  Virtual reality I	KZ	4
	ا ual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The co	1	
	creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social		,
BIE-ZRS	Basics of Systems Control	Z,ZK	4
	asics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the		
· · · · · · · · · · · · · · · · · · ·	ated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus	· · · · · · · · · · · · · · · · · · ·	-
=	ng and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teac ic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course i	-	
-	a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and design verification and design		
is also given to sen	sors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameter	ers and certain asp	ects of the
industrial implem	entation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful exam	ples and practical i	ndustrial
DIE 700 04	implementations.	7 71/	
BIE-ZRS.21	Basics of System Control  n introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It covers base	Z,ZK	5 e feedback
-	namical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear dis	-	
design and verificat	on of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stall	oility of control syst	ems, single
	d continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digita	l controllers.	
BIE-ZUM	Artificial Intelligence Fundamentals		
Students are introdi		Z,ZK	4
snace search, multi	iced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical	al tasks from the ar	eas of state
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TVKLV	Physical Education Course	Z	0				
TVV	Physical education	Z	0				
TVV0	Physical education	Z	0				
UKCJP	Czech language for advanced	Z,ZK	2				
A	An advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with validity for CTU.						

For updated information see <a href="http://bilakniha.cvut.cz/en/FF.html">http://bilakniha.cvut.cz/en/FF.html</a> Generated: day 2025-11-30, time 06:49.