Study plan

Name of study plan: Teaching Informatics for Secondary Schools

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: U itelství informatiky pro st ední školy Type of study: Follow-up master full-time Required credits: 102 Elective courses credits: 18 Sum of credits in the plan: 120 Note on the plan: Aby student splnil alespo p edepsaných 120 kredit celkem, musí si vedle povinných a povinn volitelných p edm t , p edepsaných tímto plánem zapisovat a splnit kterékoliv fakultní magisterské odborné p edm ty.

Name of the block: Compulsory courses in the program Minimal number of credits of the block: 90 The role of the block: PP

Code of the group: UNI_PP_UCIPKA1 Name of the group: Teacher propedeutics 1, Compulsory courses Requirement credits in the group: In this group you have to gain at least 6 credits (at most 24) Requirement courses in the group: In this group you have to complete at least 2 courses (at most 6) Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
32MC-P-MSVV-01	Social Science Research Methods	Z,ZK	3	1P+1C		PP
32MC-P-ODID-01	General Didactics	Z,ZK	5	2P+1C		PP
32MC-P-PEDO-01	General Pedagogy	Z,ZK	5	2P+1C		PP
32MC-P-PSEP-01	Psychology in Educational Process	Z,ZK	5	2P+1C		PP
32MC-P-U SP-01	Role of Teachers in Modern Society	ZK	3	2P+0C		PP
32MC-P-PEDS-01	Social Pedagogy	ZK	3	2P+0C		PP

Characteristics of the courses of this group of Study Plan: Code=UNI_PP_UCIPKA1 Name=Teacher propedeutics 1, Compulsory courses

32MC-P-MSVV-01	Social Science Research Methods	Z,ZK	3
32MC-P-ODID-01	General Didactics	Z,ZK	5
32MC-P-PEDO-01	General Pedagogy	Z,ZK	5
32MC-P-PSEP-01	Psychology in Educational Process	Z,ZK	5
32MC-P-U SP-01	Role of Teachers in Modern Society	ZK	3
32MC-P-PEDS-01	Social Pedagogy	ZK	3

Code of the group: UNI-PP-OBD

Name of the group: Sector didactics - compulsory courses of the program Teaching Computer Science for secondary school

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

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

Credits in the group: 32

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
UNI-DI1	Didactics of Informatics I	Z,ZK	6	2P+2C	L	PP
UNI-DI2	Didactics of Informatics II	KZ	7	1P+2C	L	PP
UNI-IB	Information security Ji í Bu ek	Z,ZK	5	2P+2C	L	PP
UNI-MTUI	Modern technology and artificial intelligence Pavel Surynek	Z,ZK	5	2P+2C	L	PP
UNI-SPD	Semester project for thesis	Z	3	90ZP	Z	PP
UNI-TP	Computer technology Martin Kohlík	Z,ZK	6	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=UNI-PP-OBD Name=Sector didactics - compulsory courses of the program Teaching Computer Science for secondary school

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UNI-DI1	Didactics of Informatics I	Z,ZK	6
The course builds on the	e subjects General Pedagogy and General Didactics and applies the acquired knowledge to didactics in the field of informati	cs and related tec	hnologies. The
student will get acquaint	ted with the ways of theoretical teaching of information technologies and in connection with their practical practice and verific	ation of knowledg	je.
UNI-DI2	Didactics of Informatics II	KZ	7
The course builds on the	e subject Didactics of Informatics I and applies the knowledge to the practical use of evaluation tools for various types of tests M	oodle (theory), M	arast (examples,
mathematics, informatic	s), Progtest (programs in C/C++), LearnShell (bash scripts). Students learn to work with the tools, prepare/program example	s and test them o	n each other.
Students get acquainted	and help with preparing real tests from selected topics, get acquainted and help with the preparation of programming comp	etitions for secon	dary school. The
course is significantly bu	uilt on independent work and processing of semester project (this corresponds to the credit load).		
UNI-IB	Information security	Z,ZK	5
The course covers the a	rea of description of basic cryptographic schemes and also introduces students to the basics of network and system security	Great attention	s paid to current
topics of cyber security,	such as ethical hacking, penetration testing and malware. At the end of the course students are introduced to the issues of s	ecure programmi	ng, security of
web applications. Stude	nt learns how to avoid traps that can be set for users and thus basics of safe behavior of users and risk minimization.		
UNI-MTUI	Modern technology and artificial intelligence	Z,ZK	5
Students will get acquair	nted with selected tools that can be used for data acquisition and processing and subsequently for their analysis and visualizat	ion. Using real dat	a and problems,
the basics of machine le	earning and artificial intelligence will be explained. In the next part of the course, the acquired knowledge will be used to work	with tools for wo	rking with image
data. In the last part of t	he course, students will get acquainted with the basics of robotics, especially agent systems and motion planning.		
UNI-SPD	Semester project for thesis	Z	3
The aim of the course is	to deepen standards and requirements for theses. It takes place mainly in the form of individual consultations with supervise	ors of theses and	independent
work. At the beginning o	f the course there is a block meeting with students, which introduces the student to the requirements for theses and the inter	connection of pro	fessional and
didactic issues. Total bui	rden in the range of 3 ECTS. The student prepares a research of resources according to the supervisor's request, chooses a	method of work,	or prepares a
separate chapter.			
UNI-TP	Computer technology	Z,ZK	6
The course practically for	ocuses on embedded systems and low-level software. It explains that the basis is the design of algorithms and their impleme	ntation, whether i	n hardware or in
software, with regard to	limiting conditions (size, speed, reliability). Topics are discussed in an overview form and practiced on specific examples in th	e laboratory. Labo	oratory exercises
are aimed at getting stud	dents acquainted with teaching methods, e.g. how to show that there is not only reconfigurable software (a program in rewrit	able memory) but	also hardware
(FPGA). It demonstrates	s how to adapt tasks to the teaching of secondary school students and their expected knowledge, e.g. by means of interactive	e tutorials.	

Code of the group: UNI-PP-PR

Name of the group: Practice - compulsory courses of the programme Teaching Informatics for Secondary Schools

Requirement credits in the group: In this group you have to gain 24 credits

Requirement courses in the group: In this group you have to complete 3 courses

Credits in the group: 24

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
UNI-PPP	Propedeutics of pedagogical practice	KZ	6	2P+2C	L	PP
UNI-RPP	Reflection of teaching practice	Z	3	26XH	Z	PP
UNI-SPP	Continuous teaching practice	KZ	15	450XH	Z	PP

Characteristics of the courses of this group of Study Plan: Code=UNI-PP-PR Name=Practice - compulsory courses of the programme Teaching Informatics for Secondary Schools

UNI-PPP	Propedeutics of pedagogical practice	KZ	6
The course is focused of	on the preparation of students for lessons before teaching practice.		
UNI-RPP	Reflection of teaching practice	Z	3
In the practically focuse	d subject, special attention will be paid to the joint search for suitable solutions to the most common difficulties of pedagogica	al practice, as wel	as to effective
ways of coping with dyn	amic changes in contemporary education. Teaching mainly builds on the targeted building of a safe space to reflect one's own	dispositions for le	earning, to share
and process emotions a	as well as challenging topics from practice, including presentation and communication of students' first pedagogical outputs. F	Procedures includ	ed: structured
discussion, feedback int	terviews and mentoring.		

UNI-SPP	Continuous teaching practice	KZ	15
Before entering	the practice, the student undergoes the propedeutic of the teaching practice. The first part of the direct practice includes, in particula	r, hospitalization	at a particular
school and the	processing of hospitalization protocols. In the next part, students also directly enter the lessons and engage in activities related to the	e running of the s	chool. At least
192 hours part	cipate in the direct teaching activity, of which 96 hours directly teach either alone or in a couple. Home preparation for teaching, proto	col processing, e	tc., i.e. a total of
450 hours is in	luded in the 15 credits		

Code of the group: UNI-PP-PO

Name of the group: compulsory Sectorials of the program Teaching Informatics for secondary schools Requirement credits in the group: In this group you have to gain 19 credits

Requirement courses in the group: In this group you have to complete 3 courses

Credits in the group: 19

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
UNI-ADS	Algorithms and data structures Tomáš Valla	Z,ZK	7	2P+2C	L	PP
UNI-PS	Computers and networks Petr Zemánek	Z,ZK	6	2P+2C	Z	PP
UNI-VSA	Development of SW applications Michal Valenta	Z,ZK	6	2P+2C	L	PP

Characteristics of the courses of this group of Study Plan: Code=UNI-PP-PO Name=compulsory Sectorials of the program Teaching Informatics for secondary schools

UNI-ADS Algorithms and data structures Z,ZK	1
The course covers the most basic of the efficient algorithms, data structures and graph theory that every computer scientist should know. As part of the exercise, stuc	nts are introduced
to the use of explained algorithms for solving practical problems. Furthermore, students gain basic knowledge of the design and use of finite automata, regular exp	ssions, the use of
context-free grammars and the design and use of stack automata. They are introduced to the Turing machine and to the complexity classes P and NP.	
UNI-PS Computers and networks Z,ZK	6
Students are generally explained the principles of the internal organization and architecture of computer systems. Using simple examples, they will understand how a	andard multi-core,
vector- and GPU-accelerated computer connected to the Internet processes, stores and sends data in a multi-user operating system. The work at the command-lin	level penetrates
the entire subject and will be explained continuously.	
UNI-VSA Development of SW applications Z,ZK	6
The lectures consist of topics devoted to methodology, SW systems architectures, technology platforms as well as support tools used in practice shared code report	tories, CI/CD
(Continuous Integration / Continuous Delivery) tools, application repositories (Google Play, App Store, Github, Gitlab,). The space will also be devoted to the use of	SW components
and services provided to developers, often free of charge (cloud storage, bug logging, authentication/authorization using Google or Facebook accounts and others). The	eminars/exercises
are designed so that students can try out at least one of many possible ways of developing and deploying a simple SW application.	

Code of the group: UNI-DIP

Name of the group: Diploma Thesis of the Computer Science Teaching Program Requirement credits in the group: In this group you have to gain 9 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 9

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
UNI-DIP	Diploma Thesis Tomáš Valla	Z	9	270ZP	L	PP

Characteristics of the courses of this group of Study Plan: Code=UNI-DIP Name=Diploma Thesis of the Computer Science Teaching Program

 UNI-DIP
 Diploma Thesis
 Z
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 The eaching is based on individual consultations with the supervisor of the thesis or another consultant (didactic part). The scope of the 9 ECTS lessons (i.e. about 270 hours) includes consultations, preparation of the theoretical part, practical part, writing and defence of the thesis before the commission.
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Name of the block: Compulsory elective courses Minimal number of credits of the block: 12 The role of the block: PV

Code of the group: UNI-PV-SZ Name of the group: Study bases - compulsory elective courses of the program Teaching Informatics for Secondary Schools

Requirement credits in the group: In this group you have to gain at least 6 credits (at most 135) Requirement courses in the group: In this group you have to complete at least 2 courses (at most 27) Credits in the group: 6 Note on the group:

Note on the grou	ip:					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
NIE-KRY	Advanced Cryptology Róbert Lórencz, Ji í Bu ek Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	PV
NIE-PDB	Advanced Database Systems Martin Svoboda Martin Svoboda (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-PIS	Advanced Information Systems Petra Pavlí ková, Petr Kroha Petra Pavlí ková Petr Kroha (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-AIB	Algorithms of Information Security Róbert Lórencz, Martin Jure ek Martin Jure ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-ADP	Architecture and Design patterns Ji í Borský Jan Kurš Filip K ikava (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-SIM	Digital Circuit Simulation and Verification Martin Kohlik Martin Kohlik Martin Kohlik (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-DSV	Distributed Systems and Computing Pavel Tvrdík, Peter Macejko Peter Macejko Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-EPC	Effective C++ programming Daniel Langr Daniel Langr (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-EHW	Embedded Hardware Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-BVS	Embedded Security Ji í Bu ek, Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	L	PV
NIE-ESW	Embedded Software Miroslav Skrbek, Hana Kubátová Miroslav Skrbek Hana Kubátová (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-BKO	Error Control Codes Pavel Kubalik Pavel Kubalik (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-FME	Formal Methods and Specifications Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-GPU	GPU Architectures and Programming Ivan Šime ek Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-HWB	Hardware Security Ji í Bu ek Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	L	PV
NIE-MKY	Mathematics for Cryptology Róbert Lórencz, Martin Jure ek, Olha Jure ková Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	3P+1C	L	PV
NIE-AM1	Middleware Architectures 1 Milan Doj inovski, Tomáš Vitvar, Jaroslav Kucha Jaroslav Kucha Tomáš Vitvar (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-MTI	Modern Internet Technologies Alexandru Moucha, Viktor erný Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-MCC	Multicore CPU Computing Daniel Langr, Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-SIB	Network Security Simona Forn sek, Ji í Dostál, Tomáš Zahradnický, Gramoz Cubreli Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	L	PV
NIE-NSS	Normalized Software Systems Robert Pergl, Marek Suchánek, Jan Verelst Robert Pergl Robert Pergl (Gar.)	ZK	5	2P	L	PV
NIE-REV	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	PV
NIE-SBF	System Security and Forensics Ji í Bu ek, Simona Forn sek, Tomáš Zahradnický, Marián Svetlík Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-TES	Systems Theory Stefan Ratschan, Ji í Vysko il, Tomáš Kolárik Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-TSP	Testing and Reliability Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	PV
NIE-NUR	User Interface Design Josef Pavlí ek Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+1C	Z	PV
NIE-VCC	Virtualization and Cloud Computing Jan Fesl, Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	PV

Characteristics of the courses of this group of Study Plan: Code=UNI-PV-SZ Name=Study bases - compulsory elective courses of the program Teaching Informatics for Secondary Schools

NIE-KRY	Advanced Cryptology	Z,ZK	5	
Students will learn the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the mathematical principles of				
random number generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they can apply to the integration of				
their own systems or to the creation of their own software solutions.				

NIE-PDB Advanced Database Systems	Z,ZK	5
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Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of data	•	
databases), with the related new data models (XML, graph databases, column databases) and languages for working with them (XQuery, XPath, C	YPHER, Gremlin)	The last part of
the course deals with performance evaluation of database machines. This course is equivalent to the course MIE-PDB.		
NIE-PIS Advanced Information Systems	Z,ZK	5
Students learn the notion of business process logic and its formalization, with business process roles, business rules, and data processing, with the r		1
enterprise services and service solution of business logic. They get acquainted with these notions also for the other types of ISs. They learn about a		
artificial intelligence methods for implementation of these ideas in ISs. They understand modern object-oriented methodologies for modelling of bus	iness processes,	business rules,
processed data, and enterprise ISs. They will get the rules and technologies for successful implementation of IS.		
NIE-AIB Algorithms of Information Security	Z,ZK	5
Students will get acquainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, s	tudents will learn t	he mathematical
principles of cryptographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware dete		
learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic systems.	1	
NIE-ADP Architecture and Design patterns	Z,ZK	5
The objective of this course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysi	is as well as with ເ	understanding of
the challenges, issues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowled	ae of object-orient	ed programming
and get familiar with the commonly used object-oriented design patterns that represent the best practices for solving common software design proble		
will be introduced to the principles of software architecture design and analysis. This includes the classical architectural styles, component based syst	ems, and some ac	vanced software
architectures used in large-scale distributed systems.		
NIE-SIM Digital Circuit Simulation and Verification	Z,ZK	5
Aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level	1 '	-
	inicacinity) lovele (
properties of proper tools. The course covers today recent verification methods, too.	1	
NIE-DSV Distributed Systems and Computing	Z,ZK	5
Students are introduced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computer students are introduced to methods.	uting processes an	d communication
channels. They learn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms the		
data and services, and safety in case of failures.	inde ouppoint ingred	
NIE-EPC Effective C++ programming	Z,ZK	5
Students learn how to use the modern features of contemporary versions of the C++ programming language for software development. The course	focuses on progra	mming effectivity
and efficiency in the form of writing maintainable and portable source code and creating correct programs with low memory and processor time req	uirements.	
	1	
NIE-EHW Embedded Hardware	Z,ZK	5
The course brings basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is t	the base of advan	ced embedded
systems, that profit from their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discuss	sed, including star	dardized means
of internal communication, parallelism extraction and utilization in special structures and system architectures.		
	Z.ZK	5
	1 /	-
Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of c	ryptographic primi	tives in hardware
and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resource and resour	urces for securing i	nternal functions
of computer systems.		
NIE-ESW Embedded Software	Z,ZK	5
		-
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the		
in C language and code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing	i, up to sophisticat	ed techniques
combined with artificial intelligence.		
NIE-BKO Error Control Codes	Z,ZK	5
The course expands the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary ma	1 '	-
linear, cyclic codes and codes for the correction of multiple errors, clusters of errors and whole syllables (bytes). Students will also learn how to imp		cuons and
corrections for different types of transmissions (parallel, serial) when storing data in memory and when transmitting over telecommunication channel	els.	
NIE-FME Formal Methods and Specifications	Z,ZK	5
Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use som	1	at allow to prove
basic properties of software.		
		_
NIE-GPU GPU Architectures and Programming	Z,ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the	CUDA programm	ing environment,
which is already a widespread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical	computational str	uctures, students
will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.		
	7 71/	F
NIE-HWB Hardware Security	Z,ZK	5
The course provides the knowledge needed for the analysis and design of computer systems security solutions. Students get an overview of safegu	-	-
using hardware means. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Stu	idents will gain kn	owledge about
the cryptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions of the c	computer.	
		5
NIE-MKY Mathematics for Cryptology	Z,ZK	1
Students will gain deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers.		
on the problem of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of disc	rete logarithm. The	e problem of
factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.		
NIE-AM1 Middleware Architectures 1	Z,ZK	5
	1	
Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information sy		
architecture and aplication servers. The will also study principles and technologies for middleware focused on application integrations, asynchronous of	ommunications an	a nigh availability
of applications. This course replaces the course MIE-MDW.		
NIE-MTI Modern Internet Technologies	Z,ZK	5
Students learn advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with rou	1	1
	any techniques a	10 11010101
technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile security.	1	
NIE-MCC Multicore CPU Computing	Z,ZK	5
Students will get acquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations of	n multicore proces	sors with shared
and virtually shared memory, which are today the most common computing nodes of powerful computer systems. Students will gain knowledge of a		
techniques used to reduce the decrease in computing power due to the widening performance gap between the computational requirements of mult		
	-core or os and r	nemory internace
throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.		

NIE-SIB Network Security	Z.ZK	5
The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically a	, ,	-
course explains basic pricipals of security monitoring, packet-based and flow-based analysis, in order to detect anomalies and suspicious network tr		
explanation and practical examples of various mechanisms of securing network infrastructure and detection in real time. The course covers general		
security events (i.e. incident handling and incident response).	intelpate of nana	ing dotootod
NIE-NSS Normalized Software Systems	ZK	5
Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from engineer		-
theory and entropy from thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related is	-	
architecture. In the second part of the course, students learn how to construct software architectures using a set of 5 design patterns called elements		° .
functionality of information systems in terms of storing data, executing actions, workflows, connectors, and triggers, while handling violations of the stab		
This knowledge allows students to realize new levels of evolvability in software architectures.	,	
NIE-REV Reverse Engineering	Z.ZK	5
Students will learn fundamentals of reverse engineering of computer software (methods of executing and initializing programs, organization of execu	, i	-
libraries). Special attention will be paid to C ++. Students will also become familiar with the principles of debugging tools, disassemblers and obfusca		
will focus on code compression and decompression and executable file reconstruction.		
NIE-SBF System Security and Forensics	Z,ZK	5
Students will be introduced to various aspects of system security (principles of endpoint security, principles of security policies, security models, auth	,	s). Students will
also learn about forensic analysis as a tool for investigating security incidents (techniques used by malicious software or attackers, forensic analysis		
of memory or file system artifacts for attack analysis and detection).		
NIE-TES Systems Theory	Z,ZK	5
Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However	er, the costs of ma	naging this
complexity and of ensuring the correct behavior of a given system have become critical. A key technique for mastering this complexity is the usage of	f models that des	cribe only those
aspects of the systems that are important for the task at hand, and automated tools for analyzing those models. This subject will present theory and	algorithms that for	rm the basis for
the modeling and analysis of complex systems.		
NIE-TSP Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to	orepare a test set	with the help of
the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with	built-in-self-test e	quipment. They
will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NIE-NUR User Interface Design	Z,ZK	5
Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, for	mal user models,	the fundamental
notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able	to design advance	ed Uls.
NIE-VCC Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	l organizations. Th	ney will get
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to effi	ciently operate an	d optimize the
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ve technology too	lay for the
management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skill	ls in the use of mo	dern integration
		grante grante i
and development tools (Continuous integration and development).		
and development tools (Continuous integration and development).		

Code of the group: UNI-PV-UCIPKA2

Name of the group: Teacher propedeutics 2 - Compulsory elective courses Requirement credits in the group: In this group you have to gain at least 6 credits (at most 18) Requirement courses in the group: In this group you have to complete at least 2 courses (at most 6) Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
32MC-P-DLAB-01	Didactics of Laboratories	KZ	3	0P+2C		PV
32MC-P-OSPN-01	Personality: Pathology and Normality	KZ	3	1P+1C		PV
32MC-P-PSHY-01	Psycho-hygiene Aspects of Teaching Profession	Z,ZK	3	1P+1C		PV
32MC-P-SPKO-01	Social and Pedagogical Communication	KZ	3	0P+2C		PV
32MC-P-TECR-01	Impacts of Information Technology on Society	Z,ZK	3	1P+1C		PV
32MC-P-RIZZ-01	Risk Behavior of Pupils	KZ	3	1P+1C		PV

Characteristics of the courses of this group of Study Plan: Code=UNI-PV-UCIPKA2 Name=Teacher propedeutics 2 - Compulsory elective courses

32MC-P-DLAB-01	Didactics of Laboratories	KZ	3
32MC-P-OSPN-01	Personality: Pathology and Normality	KZ	3
32MC-P-PSHY-01	Psycho-hygiene Aspects of Teaching Profession	Z,ZK	3
32MC-P-SPKO-01	Social and Pedagogical Communication	KZ	3
32MC-P-TECR-01	Impacts of Information Technology on Society	Z,ZK	3
32MC-P-RIZZ-01	Risk Behavior of Pupils	KZ	3

Name of the block: Elective courses Minimal number of credits of the block: 0 The role of the block: V

Code of the group: UNI-V

Name of the group: Elective courses of the Teaching Informatics for Secondary Schools program Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
NI-ADM	Data Mining Algorithms Rodrigo Augusto Da Silva Alves, Pavel Kordík, Daniel Vašata Daniel Vašata Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	L	V
NI-AIB	Algorithms of Information Security Róbert Lórencz, Martin Jure ek, Olha Jure ková Martin Jure ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+1C	z	V
NI-ADP	Architecture and Design patterns Ji í Borský, Filip K ikava, Jan Kurš, Jan Zimolka, Tomáš Chvosta Jan Kurš Filip K ikava (Gar.)	Z,ZK	5	2P+1C	z	V
NI-AM1	Middleware Architectures 1 Tomáš Vitvar, Jaroslav Kucha Jaroslav Kucha Tomáš Vitvar (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-AM2	Middleware Architectures 2 Tomáš Vitvar, Jaroslav Kucha Jaroslav Kucha Tomáš Vitvar (Gar.)	Z,ZK	5	2P+1C	L	V
NI-BML	Bayesian Methods for Machine Learning Kamil Dedecius, Ond ej Tichý Ond ej Tichý Kamil Dedecius (Gar.)	KZ	5	2P+1C	L	V
NI-BVS	Embedded Security Martin Novotný Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	L	V
NI-BKO	Error Control Codes Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+1C	L	V
NI-DSV	Distributed Systems and Computing Pavel Tvrdík Jan Fesl Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-DDW	Web Data Mining Milan Doj inovski, Jaroslav Kucha Jaroslav Kucha (Gar.)	Z,ZK	5	2P+1C	L	V
NI-EPC	Effective C++ programming Daniel Langr Daniel Langr (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-EVY	Efficient Text Pattern Matching Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-FME	Formal Methods and Specifications Stefan Ratschan Stefan Ratschan Stefan (Gar.)	Z,ZK	5	2P+1C	L	V
NI-GEN	Code Generators Petr Máj, Jan Janoušek Petr Máj Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-GAK	Graph theory and combinatorics Michal Opler Tomáš Valla Tomáš Valla (Gar.)	Z,ZK	5	2P+2C	L	V
FITE-GRI	Grid Computing Pavel Tvrdík	Z,ZK	5	2P+1C	Z	V
NI-HWB	Hardware Security Jií Bu ek Jií Bu ek Jií Bu ek (Gar.)	Z,ZK	5	2P+2C	L	V
FITE-EHD	Introduction to European Economic History	Z,ZK	3	2P+1C	L	V
NI-KOD	Data Compression Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	L	V
NI-MKY	Mathematics for Cryptology Róbert Lórencz, Martin Jure ek Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	3P+1C	L	V
NI-MVI	Computational Intelligence Methods Pavel Kordík Pavel Kordík Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MEP	Modelling of Enterprise Processes Robert Pergl, Marek Suchánek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPJ	Modelling of Programming Languages	Z,ZK	5	2P+1C	Z	V
FIT-ITI	Modern IT infrastructure Ivan Šime ek	Z,ZK	5	2P+1C	Z,L	V
NI-MTI	Modern Internet Technologies Alexandru Moucha, Viktor erný Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-NUR	User Interface Design Josef Pavlí ek Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-NON	Nonlinear Continuous Optimization and Numerical Methods Jaroslav Kruis Jaroslav Kruis Jaroslav Kruis (Gar.)	Z,ZK	5	2P+1C	Z,L	V
NI-NSS	Normalized Software Systems Robert Pergl, Marek Suchánek, Jan Verelst Robert Pergl Robert Pergl (Gar.)	ZK	5	2P	L	V
NI-OSY	Operating Systems and Systems Programming Petr Zemánek, Tomáš Martinec Petr Zemánek Petr Zemánek (Gar.)	Z,ZK	5	2P+1C	Z	V

NI-BUI	Business Informatics	Z,ZK	5	2P+2C	L	V
	Petra Pavlí ková Petra Pavlí ková Petra Pavlí ková (Gar.) Enterprise Information Systems			00.40		
NI-PIS	Martin Żávrbský, Martin Mach, Vlastimil Jinoch, Martin Hasaj David Buchtela David Buchtela (Gar.)	Z,ZK	5	2P+1C	L	V
NI-KRY	Advanced Cryptology Róbert Lórencz, Ji í Bu ek Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	V
NI-PAS	Advanced Aspects of Business David Buchtela, Št pánka Havlíková, Dominik Vítek, Ji í Maršál, Jana Soukupová, Zden k Ku era David Buchtela Zden k Ku era (Gar.)	Z,ZK	4	2P+1C	z	v
NI-PDB	Advanced Database Systems Michal Valenta, Yelena Trofimova Michal Valenta (Gar.)	Z,ZK	5	2P+1C	Z	V
FIT-ACM1	Programming Practices 1 Tomáš Valla	KZ	5	4C	L	V
FIT-ACM2	Programming Practices 2 Ond ej Suchý	KZ	5	4C	Z	V
FIT-ACM3	Programming Practices 3 Ond ej Suchý	KZ	5	4C	L	V
FIT-ACM4	Programming Practices 4 Ond ei Suchý	KZ	5	4C	Z	V
BI-ACM4	Programming Practices 4 Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
FIT-ACM5	Programming Practices 5 Ond ej Suchý	KZ	5	4C	L	V
FIT-ACM6	Programming Practices 6 Ond ej Suchý	KZ	5	4C	L	V
NI-GPU	GPU Architectures and Programming Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	L	V
NI-PDD	Data Preprocessing Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-REV	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
NI-RUN	Buntime Systems Filip K ikava Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+1C	L	V
NI-SWE	Semantic Web and Knowledge Graphs Milan Doj inovski, Jakub Klímek Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-SIM	Digital Circuit Simulation and Verification	Z,ZK	5	2P+1C	L	V
NI-SIB	Martin Kohlík Martin Kohlík Martin Kohlík (Gar.) Network Security Simona Forn sek, Ji í Dostál, Martin Šutovský, Martin Holec Simona Forn sek Ji í Dostál (Gar.)	Z,ZK	5	2P+1C	L	v
NI-SCR	Statistical Analysis of Time Series Kamil Dedecius Kamil Dedecius (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-SLA	Sublinear algorithms Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+1C	Z	V
FIT-SEP	World Economy and Business	Z,ZK	4	2P+2C	L	V
NI-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-SBF	System Security and Forensics Simona Forn sek, Marián Svetlík Simona Forn sek Róbert Lórencz (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-DSS	Decision Support Systems Petra Pavlí ková, Robert Pergl, David Buchtela David Buchtela Robert Pergl (Gar.)	Z,ZK	5	2P+1C	Z	v
NI-TES	Systems Theory Stefan Ratschan, Ji í Vysko il Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
NI-TSW	Software Product Development Petra Pavlí ková Petra Pavlí ková (Gar.)	KZ	4	1P+2C	Z	V
NI-UMI	Artificial intelligence Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-EHW	Embedded Hardware Jan Schmidt Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-ESW	Embedded Software Miroslav Skrbek, Hana Kubátová Miroslav Skrbek Hana Kubátová (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Jan Fesl, Tomáš Vondra Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
NI-APR	Selected Methods for Program Analysis	Z,ZK	5	2P+1C	Z	V
NI-PON	Filip K ikava Filip K ikava Filip K ikava (Gar.) Selected Topics in Optimization and Numerical mathematics Daniel Vašata, Št pán Starosta, Karel Klouda Daniel Vašata Št pán Starosta (Gar.)	Z,ZK	5	2P+1C	L	V
NI-VMM	(Gar.) Retrieval from Multimedia Tomáš Skopal, Ji í Novák Jaroslav Kucha Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	Z	V
	Multicore CPU Computing	Z,ZK	5	2P+1C	Z	v

FITE-SEP	World Economy and Business	Z,ZK	4	2P+2C	Z	V
	the courses of this group of Study Plan: Code=UNI-V Name=Elect	tive courses	of the Te	eaching Ir	iformatics	s for
Secondary School	· · ·			7	Z,ZK	5
	Data Mining Algorithms algorithms used in the fields of machine learning and data mining. However, this is not an ir	ntroductory cours	e and the s			
	put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learn	-				-
methods).				-		
	Algorithms of Information Security			1	Z,ZK	5
	ted with the algorithms of secure key generation and cryptographic error (not only biometric	, , ,				
	ic protocols (identification, authentication, and signature schemes). Another part of the co tems. The last topic includes practical steganographic methods and attacks on steganogra		to maiware	e detection ar	id the use of	machine
	Architecture and Design patterns			7	Z,ZK	5
1	rse is to provide students with both work knowledge about the underlying foundations of o	bject-oriented de	sign and an			
-	and tradeoffs of advanced software design. In the first part of the course, the students will r	-		-	-	
-	commonly used object-oriented design patterns that represent the best practices for solving				-	
	principles of software architecture design and analysis. This includes the classical architectu ge-scale distributed systems.	urai styles, compo	nent based	systems, and	J Some advar	iced software
	Middleware Architectures 1			Z	Z,ZK	5
1	trends, concepts, and technologies in the area of service-oriented architectures. The will g	ain an overview c	of informatio		· 1	-
	on servers. The will also study principles and technologies for middleware focused on applica	ation integrations,	asynchrono	ous communio	cations and hi	gh availability
of applications.						
1	Middleware Architectures 2 rends and technologies on the Web including theoretical foundations. They will gain an over	onviow of Mob an	plication ar		Z,ZK	5 tochnologios
	buted cache and databases, smart contracts, realtime communications. They will gain all over	erview or web ap	plication and	siniectures, c	oncepts and	lechnologies
	Bayesian Methods for Machine Learning				KZ	5
1	n practical use of basic Bayesian modeling methods in the dynamically evolving machine le	earning theory. In	particular, it	1	1	-
	ption of real phenomena, as well as their subsequent use, e.g., for forecasting of future evo	-				-
-	etc.). The emphasis is put on understanding of explained principles and methods and their p	-		-		-
some of them.	presented to students, for instance, 2D/3D object tracking, radiation source term estimation	n, or separation in	i medical in	naging. The s	students will th	ly to solve
	Embedded Security			Z	Z,ZK	5
	wledge in selected topics of cryptography and cryptanalysis. The course focuses particularly	/ on efficient imple	ementations	1	· ·	s in hardware
	ed systems). Students gain a good overview of functionality of (hardware) cryptographic acc	celerators, smart	cards, and r	esources for	securing inte	rnal functions
of computer systems.					771/	
1	Error Control Codes s to present various ways to detect or correct individual errors and burst errors in data store	ed into memories	or transmit	1	Z,ZK	5
-	Distributed Systems and Computing				Z,ZK	5
	to methods for coordination of processes in distributed environment characterised by nondete	erministic time resp	oonses of co			-
	sic algorithms that assure correctness of computations realized by a group of loosely coupl	led processes and	d mechanis	ms that supp	ort high avail	ability of both
data and services, and s						
	Web Data Mining methods and technologies for web data acquisition, analysis and utilization of the discove	and knowledge C	Studente wil		Z,ZK	5 mining
	ing, Web structure analysis, Web usage analysis, Web content mining and information extrac	-		-		-
	and recommendation systems.		<u>.</u>			
NI-EPC	Effective C++ programming			Z	Z,ZK	5
	se the modern features of contemporary versions of the C++ programming language for so	-				ing effectivity
	n of writing maintainable and portable source code and creating correct programs with low	memory and pro	cessor time			
	Efficient Text Pattern Matching of efficient algorithms for text pattern matching. They learn to use so called succinct data stru	uctures that are e	fficient in bo		Z,ZK	5 rv complexity
	the knowledge in design of applications that utilize pattern matching.					y complexity.
	Formal Methods and Specifications			Z	Z,ZK	5
	cribe semantics of software formally and to use sound reasoning for construction of correct	t software. They le	earn to use	some softwa	re tools that a	allow to prove
basic properties of softw						
	Code Generators				Z,ZK	5
	translating programs written in high-level programming languages are essential for unders thms and techniques used to translate more complex programming constructs of modern la	-	-			-
	oretical and practical aspects of implementing the back-end of optimizing compilers for pro-		-	no programm	ing. Otadonia	
NI-GAK	Graph theory and combinatorics			Z	Z,ZK	5
The goal of the class is t	o introduce the most important topics in graph theory, combinatorics, combinatorial structu	ures, discrete mo	dels and alg	porithms. The	emphasis wi	ill be not only
-	ic principles but also on applications in problem solving and algorithm design. The topics inclu-			-		
	, introduction to probabilistic method, properties of various special classes of graphs and c ds, formal languages and bioinformatics.	Johidinatorial Stru	clures. The	meory WIII b	e also applied	J ITT ITTE TIEIOS
	Grid Computing			7	Z,ZK	5
	howledge about the world-wide network and computing infrastructure.			1 -	.,	~
NI-HWB	Hardware Security			Z	Z,ZK	5
	knowledge needed for the analysis and design of computer systems security solutions. St	-				-
-	They will be able to safely use and integrate hardware components into systems and test the arators, PUF, random number generators, smart cards, biometric devices, and devices for in				-	edge about
I or y prographic accele	and devices for a second devices and devices and devices and devices for a			computer	•	

	Introduction to European Economic History	Z,ZK	3
	a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global e	, ,	•
	story. As European countries have been dominant actors in this process it focuses predominantly on their roles in the econom to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial insi		•
	l economic history of particular European countries but rather the impact of trade and role of particular events, institutions and	-	
	a mixture of lecture and discussion.	9	
NI-KOD	Data Compression	Z,ZK	5
	d to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of da	ata compression n	nethods being
used in practice. The o	verview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition, s	tudents learn the	fundamentals of
lossy data compressio	n methods used in image, audio, and video compression.		
NI-MKY	Mathematics for Cryptology	Z,ZK	5
	per knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers.		
	ng a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discr e solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.	ete logarithm. The	e problem of
NI-MVI	Computational Intelligence Methods	Z,ZK	5
	d methods and techniques of computational intelligence that are mostly nature-inspired, parallel by nature, and applicable to		-
	rk and how to apply them to problems related to data mining, control, intelligen games, optimizations, etc.	many probleme.	
NI-MEP	Modelling of Enterprise Processes	Z,ZK	5
	on introduction to the discipline of Enterprise Engineering. Students learn the importance of a proper methodological approact		-
implementation of proc	esses, organisation structures and information support in big enterprises and institutions.		
NI-MPJ	Modelling of Programming Languages	Z,ZK	5
The analysis, transform	hation, and code generation processes depend on the semantics of the language; in particular, they are correct if they preserv	ve the semantics	of the language.
	e semantics of programming languages. The students will learn the language models with emphasis on functional languages, st	-	
	a calculus and here get acquainted with the advanced lambda calculus. The students also get hands-on-experience with sema	-	
FIT-ITI	Modern IT infrastructure	Z,ZK	5
-	time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A		
	a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologie	es. The proposed s	solution should
NI-MTI	Innous and economically optimal operation.	Z,ZK	5
	Modern Internet Technologies tr "Modern Internet Technologies" is designed on four major pillars of networking: 1. Unified Communication and Collaboration		-
-	whatever types of protocols for whatever purposes. This architecture is able to be protocol independent and carries voice, vic	-	
	Design of Extremely Scalable Networks - This provides the insights of network architectures which can accommodate hundre		
s .	is a paradigm switch from LANs (Local Area Networks) to SPs (Service Providers). 3. Traffic Segregation, Traffic Matching an		
technologies allow service	vice providers to create private channels of communication between customers, with guaranteed parameters (bandwidth, dela	ay, jitter, type of pr	rotocol). 4.
Acceleration Technolog	ies - They allow traffic to be carried at the optimal speed and allow for graceful degradation of service parameters in case of	failures.	
NI-NUR	User Interface Design	Z,ZK	5
Students will understar	d the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, for	rmal user models,	the fundamental
	The second second state of which as a phone by and as obtained at the Theory of the second		
	s. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able	1	
NI-NON	Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5
NI-NON Students will be introdu	Nonlinear Continuous Optimization and Numerical Methods ced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met	Z,ZK	5 d problems. They
NI-NON Students will be introdu will also learn the finite	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T	Z,ZK thods to real-world hey will learn to s	5 d problems. They olve systems of
NI-NON Students will be introdu will also learn the finite linear algebraic equation	Nonlinear Continuous Optimization and Numerical Methods ced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met	Z,ZK thods to real-world hey will learn to s	5 d problems. They olve systems of
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel.	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme	Z,ZK thods to real-work hey will learn to s ent these algorithm	5 d problems. They olve systems of ns sequentially
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems	Z,ZK thods to real-world hey will learn to s ent these algorithm ZK	5 d problems. They olve systems of ns sequentially 5
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS Students will learn the	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from enginee	Z,ZK thods to real-world hey will learn to s ent these algorithm ZK ring, such as stat	5 d problems. They olve systems of ns sequentially 5 jility from system
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS Students will learn the theory and entropy from	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems	Z,ZK thods to real-world hey will learn to s ent these algorithm ZK ring, such as stat ssues occur in an	5 d problems. They olve systems of ns sequentially 5 jility from system y given software
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS Students will learn the theory and entropy from architecture. In the sec	Nonlinear Continuous Optimization and Numerical Methods liced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from enginee in thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related is	Z,ZK thods to real-work hey will learn to s ent these algorithm ZK ring, such as stat ssues occur in an s. These elements	5 d problems. They olve systems of ns sequentially 5 jility from system y given software provide the core
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS Students will learn the theory and entropy from architecture. In the sec functionality of information	Nonlinear Continuous Optimization and Numerical Methods uced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from enginee in thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related is ond part of the course, students learn how to construct software architectures using a set of 5 design patterns called elements	Z,ZK thods to real-work hey will learn to s ent these algorithm ZK ring, such as stat ssues occur in an s. These elements	5 d problems. They olve systems of ns sequentially 5 jility from system y given software provide the core
NI-NON Students will be introdu will also learn the finite linear algebraic equation as well as in parallel. NI-NSS Students will learn the theory and entropy from architecture. In the sec functionality of information	Nonlinear Continuous Optimization and Numerical Methods liced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such met element method and the finite difference method used for solving ordinary and partial differential equations in engineering. T ons that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to impleme Normalized Software Systems foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from enginee In thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related is ond part of the course, students learn how to construct software architectures using a set of 5 design patterns called elements ion systems in terms of storing data, executing actions, workflows, connectors, and triggers, while handling violations of the stab	Z,ZK thods to real-work hey will learn to s ent these algorithm ZK ring, such as stat ssues occur in an s. These elements	5 d problems. They olve systems of ns sequentially 5 jility from system y given software provide the core
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NI-PDB Advanced Database Systems	Z,ZK	5
Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of databased	ase machines (so	called NoSQL
databases), with the related new data models (XML, graph databases, column databases) and languages for working with them (XQuery, XPath, CY	PHER, Gremlin).	The last part of
the course deals with performance evaluation of database machines.		
FIT-ACM1 Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM2 Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	1/7	
FIT-ACM3 Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	V7	E
FIT-ACM4 Programming Practices 4 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM4 Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.	Γ\ <u>∠</u>	5
FIT-ACM5 Programming Practices 5	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		0
FIT-ACM6 Programming Practices 6	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.		U
NI-GPU GPU Architectures and Programming	Z.ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the (, ,	-
which is already a widespread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical c		-
will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.		
NI-PDD Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various dat		.
time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character	istics from image	s or from web
pages.		
NI-REV Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens I		
is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is ded		с с
applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be de debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the compute		-
the course is on the seminars, where students will solve practically oriented tasks from the real world.		
NI-RUN Runtime Systems	Z,ZK	5
This course is an introduction to the world of virtual machines (VM) for high-level programming languages. There are two goals: Give you hands-on experied		-
of a compiler and a VM from scratch, including Abstract Syntax Tree (AST) interpretation Byte code (BC) design and interpretation AST to BC compi		
Just-in-time compilation and some optimization techniques Through a series of guest lectures, introduce you to various advanced topics and implementation		
Dynamic optimizations, speculations, and deoptimizations Language implementation frameworks Read-world VMs		
NI-SWE Semantic Web and Knowledge Graphs	Z,ZK	5
The students will learn the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web te		
practices for modelling, integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge	e graphs and thei	r systematic
quality assurance.	7 71/	
NI-SIM Digital Circuit Simulation and Verification		5
The aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Le properties of proper tools. The course covers recent verification methods, too.	ver wodening) iev	
NI-SIB Network Security	Z,ZK	5
NI-SCR Statistical Analysis of Time Series	Z,ZK	5
The course deals with the practical use of the basic time series modelling theory in engineering tasks, ranging from economics (stock exchange price		-
problems (modelling of signals and processes) to computer networks (network components load, attacks detection). The students learn to select a co		
its parameters, analyze its properties and use it for forecasting of future or intermediate values. The stress is put on understanding and adoption of the i		
real-world examples. Both the lab classes and the lectures exploit freely available software packages in order to provide easy and straightforward trai	nsfer of students'	knowledge from
the academic to the real world.		
NI-SLA Sublinear algorithms	Z,ZK	5
We will introduce three methods to tackle algorithms working in sublinear space.		
FIT-SEP World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by		
and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form o		
readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.		
NI-SYP Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of		-
of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
NI-SBF System Security and Forensics	Z,ZK	5
Students will get familiar with aspects of system security (principles of end station security, principles of security policies, security models, authentica		
students will get familiar with forensic analysis as a tool for investigating security incidents (techniques used by malicious software/attackers and fore		
importance of operating system/operating system artifacts or file system for attack analysis and detection).		
NI-DSS Decision Support Systems	Z,ZK	5
The aim of the course is to provide students with knowledge and skills in decision support systems, their classification (Powerova), selected principles		
and knowledge-oriented decision support systems. Students will also gain knowledge of multicriterial decision-making methods and game theory. They		out the principles
of conceptually and ontologically oriented decision support systems and the basics of distribution, optimization and evolution methods and algorithm	S	

NI-TES Systems Theory	Z,ZK	5
Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However	ver, the costs of ma	anaging this
complexity and of ensuring the correct behavior of a given system have become critical. A key technique for mastering this complexity is the usage		•
aspects of the systems that are important for the task at hand, and automated tools for analyzing those models. This subject will present theory and	I algorithms that fo	rm the basis for
the modeling and analysis of complex systems.		
NI-TSP Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to	prepare a test set	with the help of
the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with	h built-in-self-test e	equipment. They
will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-TSW Software Product Development	KZ	4
The course is presented in Czech.		
NI-UMI Artificial intelligence	Z,ZK	5
The course covers search and inference algorithms in major formal paradigms used in artificial intelligence such as logic theories, constraint progra	mming and autom	ated planning.
The main principles and practical applications of discussed techniques will be illustrated.		
NI-EHW Embedded Hardware	Z,ZK	5
The course brings basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is	the base of advand	ced embedded
systems, that profit from their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discuss	sed, including stan	dardized means
of internal communication, parallelism extraction and utilization in special structures and system architectures.		
NI-ESW Embedded Software	Z,ZK	5
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the	1 1	of programming
in C language and code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing	, up to sophisticat	ed techniques
combined with artificial intelligence.		-
NI-VCC Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies ar	1 2 1	
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to ef	ficiently operate a	nd optimize the
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	tive technology to	day for the
management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical sk	ills in the use of me	odern integration
and development tools (Continuous integration and development).		
NI-APR Selected Methods for Program Analysis	Z,ZK	5
This course introduces you to program analysis, i.e., the automated reasoning about the behavior of a computer program. We will cover static and d	ynamic analysis. Ir	Static Analysis,
we will look at the art of reasoning about computer programs without running them. We will look at the analyses for program understanding, optimiz	ations, error detec	tion. In Dynamic
Analysis, we will look at the analyses considering individual program runs using a concrete environment and inputs.		
NI-PON Selected Topics in Optimization and Numerical mathematics	Z.ZK	5
The course focuses on optimization problems that appear in the field of machine learning and artificial intelligence. Students broaden their knowledge	1 '	nization obtained
in the course Mathematics for informatics. The methods are explained and described along with the details on how they are implemented on compu		
of numerical matematics, mainly numerical linear algebra, are explained too.		
NI-VMM Retrieval from Multimedia	Z.ZK	5
The student obtains general knowledge regarding interfaces of portals providing multimedia content, the principles of similarity search, the methods o	1 '	
objects, indexing, and structure of distributed search engines.		
NI-MCC Multicore CPU Computing	Z,ZK	5
Students will get acquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations of		
and virtually shared memories, which are today the most common computing nodes of powerful (super)computer systems. Students will gain knowl		
optimization techniques used to reduce the performance drop due to the widening gap between the computational requirements of multi-core CPUs	•	
On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.	,	01
FITE-SEP World Economy and Business	Z.ZK	4
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries ar	1 '	-
Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedo	, ,	
development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on i		
take bachelor level of this course BIE-SEP as a prerequisite.		

List of courses of this pass:

Code	Name of the course	Completion	Credits
32MC-P-DLAB-01	Didactics of Laboratories	KZ	3
32MC-P-MSVV-01	Social Science Research Methods	Z,ZK	3
32MC-P-ODID-01	General Didactics	Z,ZK	5
32MC-P-OSPN-01	Personality: Pathology and Normality	KZ	3
32MC-P-PEDO-01	General Pedagogy	Z,ZK	5
32MC-P-PEDS-01	Social Pedagogy	ZK	3
32MC-P-PSEP-01	Psychology in Educational Process	Z,ZK	5
32MC-P-PSHY-01	Psycho-hygiene Aspects of Teaching Profession	Z,ZK	3
32MC-P-RIZZ-01	Risk Behavior of Pupils	KZ	3
32MC-P-SPKO-01	Social and Pedagogical Communication	KZ	3
32MC-P-TECR-01	Impacts of Information Technology on Society	Z,ZK	3
32MC-P-U SP-01	Role of Teachers in Modern Society	ZK	3

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NI-BML Bayesian Methods for Machine Learning KZ	-BML	Bayesian Methods for Machine Learning	KZ	5
The subject is focused on practical use of basic Bayesian modeling methods in the dynamically evolving machine learning theory. In particular, it studies the construction of a				appropriate
models providing description of real phenomena, as well as their subsequent use, e.g., for forecasting of future evolution or learning about the hidden variables (true object	-			
				-
from noisy observations etc.). The emphasis is put on understanding of explained principles and methods and their practical adoption. For this purpose, a number of real world	-			
and applications will be presented to students, for instance, 2D/3D object tracking, radiation source term estimation, or separation in medical imaging. The students will try	oplications will be	presented to students, for instance, 2D/3D object tracking, radiation source term estimation, or separation in medical imaging.	I he students will t	ry to solve
some of them.		some of them.		

NI-BUI	Business Informatics	Z,ZK	5
	se is to focus on operational, tactical and strategic management of business informatics. Students will gain knowledge in the areas of bu architectures in enterprise informatics. They will also learn about the principles, models and standards (ITIL, COBIT) in IT manageme		U ,
	nd resource management (sourcing). Students will learn the process of creating and implementing information strategy, IT Governand		-
	e context of information strategy with global business strategy. They will also gain knowledge in the areas of economic IT manageme	-	
	management, IT investment evaluation and human resources management in IT (roles CIO, CEO, CFO).		
NI-BVS	Embedded Security	Z,ZK	5
-	c knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of crypto		
and software (in en	hbedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources of computer systems.	nor securing intern	arrunctions
NI-DDW	Web Data Mining	Z,ZK	5
	arn latest methods and technologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gain		
techniques for Web	crawling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an overview	w of most recent de	evelopments
	in the field of social web and recommendation systems.	7 71/	
NI-DSS	Decision Support Systems rse is to provide students with knowledge and skills in decision support systems, their classification (Powerova), selected principles of	Z,ZK	5 del-oriented
	ented decision support systems. Students will also gain knowledge of multicriterial decision-making methods and game theory. They will		
of	conceptually and ontologically oriented decision support systems and the basics of distribution, optimization and evolution methods a	nd algorithms.	
NI-DSV	Distributed Systems and Computing	Z,ZK	5
	uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing	-	
channels. They lea	rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that s data and services, and safety in case of failures.		
NI-EHW	Embedded Hardware	Z,ZK	5
-	basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is the trom their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discussed,		
systems, that prom	of internal communication, parallelism extraction and utilization in special structures and system architectures.	including standard	izeu means
NI-EPC	Effective C++ programming	Z,ZK	5
	v to use the modern features of contemporary versions of the C++ programming language for software development. The course focus		-
and eff	iciency in the form of writing maintainable and portable source code and creating correct programs with low memory and processor t	ime requirements.	
NI-ESW	Embedded Software	Z,ZK	5
	e course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the ba d code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing, up		
in o language and	combined with artificial intelligence.	s to sopristicated t	coninques
NI-EVY	Efficient Text Pattern Matching	Z,ZK	5
Students get knowl	edge of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient in both access	s time and memory	complexity.
	They will be able to use the knowledge in design of applications that utilize pattern matching.	771	
NI-FME Students are able t	Formal Methods and Specifications o describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some so	Z,ZK	5 ow to prove
	basic properties of software.		
NI-GAK	Graph theory and combinatorics	Z,ZK	5
-	ss is to introduce the most important topics in graph theory, combinatorics, combinatorial structures, discrete models and algorithms. e basic principles but also on applications in problem solving and algorithm design. The topics include: generating functions, selected top		-
-	heory, introduction to probabilistic method, properties of various special classes of graphs and combinatorial structures. The theory w		
<i>,</i>	of combinatorics on words, formal languages and bioinformatics.		
NI-GEN	Code Generators	Z,ZK	5
	ues of translating programs written in high-level programming languages are essential for understanding the field of systems program	e 1	
understanding the	algorithms and techniques used to translate more complex programming constructs of modern languages employed in systems progra familiar with both the theoretical and practical aspects of implementing the back-end of optimizing compilers for programming lang	-	will become
NI-GPU	GPU Architectures and Programming	Z,ZK	5
	nowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the CUI		
which is already a v	videspread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical com will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.	putational structure	es, students
NI-HWB	Hardware Security	Z,ZK	5
	es the knowledge needed for the analysis and design of computer systems security solutions. Students get an overview of safeguard	-	-
-	eans. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Studer yptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions	-	edge about
NI-KOD	Data Compression	Z,ZK	5
	buced to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of data		
used in practice. The	ne overview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition, stude	ents learn the fund	amentals of
	lossy data compression methods used in image, audio, and video compression.		
NI-KRY	Advanced Cryptology	Z,ZK	5 rinciples of
	n the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know th generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they c		-
	their own systems or to the creation of their own software solutions.		-
NI-MCC	Multicore CPU Computing	Z,ZK	5
-	equainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations on mu	-	
and virtually shared memories, which are today the most common computing nodes of powerful (super)computer systems. Students will gain knowledge of architecturally specific optimization techniques used to reduce the performance drop due to the widening gap between the computational requirements of multi-core CPUs and memory interface throughput.			
On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.			
NI-MEP	Modelling of Enterprise Processes	Z,ZK	5
The subject is	focused on introduction to the discipline of Enterprise Engineering. Students learn the importance of a proper methodological approa	ch for (re)engineer	ing and
	implementation of processes, organisation structures and information support in big enterprises and institutions.		

NI-MKY	Mathematics for Cryptology	Z,ZK	5
	deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In		
on the problem of	of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discre		roblem of
NI-MPJ	factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on		F
	Modelling of Programming Languages sformation, and code generation processes depend on the semantics of the language; in particular, they are correct if they preserve t	Z,ZK	5 Janguage
-	es the semantics of programming languages. The students will learn the language models with emphasis on functional languages, stude		
	mbda calculus and here get acquainted with the advanced lambda calculus. The students also get hands-on-experience with semantic	-	
NI-MTI	Modern Internet Technologies	Z,ZK	5
SYNOPSIS The s	subject "Modern Internet Technologies" is designed on four major pillars of networking: 1. Unified Communication and Collaboration -	A single network, o	priented on
TCP/IP is able to c	carry whatever types of protocols for whatever purposes. This architecture is able to be protocol independent and carries voice, video	and data to achiev	e seamless
U	s. 2. Design of Extremely Scalable Networks - This provides the insights of network architectures which can accommodate hundreds of the second se		
	, there is a paradigm switch from LANs (Local Area Networks) to SPs (Service Providers). 3. Traffic Segregation, Traffic Matching and		
-	low service providers to create private channels of communication between customers, with guaranteed parameters (bandwidth, dela leration Technologies - They allow traffic to be carried at the optimal speed and allow for graceful degradation of service parameters in		10001). 4.
NI-MVI	Computational Intelligence Methods	Z,ZK	5
	erstand methods and techniques of computational intelligence that are mostly nature-inspired, parallel by nature, and applicable to m	1 ' 1	-
	how these methods work and how to apply them to problems related to data mining, control, intelligen games, optimizations,		
NI-NON	Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5
	troduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such method		
will also learn the	finite element method and the finite difference method used for solving ordinary and partial differential equations in engineering. They	y will learn to solve	systems of
linear algebraic eo	quations that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to implement	these algorithms s	equentially
	as well as in parallel.	714	-
NI-NSS	Normalized Software Systems	ZK	5
	the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from engineering r from thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related issu	-	-
	second part of the course, students learn how to construct software architectures using a set of 5 design patterns called elements. The		
	rmation systems in terms of storing data, executing actions, workflows, connectors, and triggers, while handling violations of the stability		
	This knowledge allows students to realize new levels of evolvability in software architectures.		
NI-NUR	User Interface Design	Z,ZK	5
Students will under	rstand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, forma	l user models, the f	undamental
notions and pr	rocesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able	e to design advanc	ed Uls.
NI-OSY	Operating Systems and Systems Programming	Z,ZK	5
	s system programming in UNIX environment. Emphasis is given on kernel development with focus on kernel architecture and kernel d	-	-
	ment, memory management, file operations and architecture of modern file systems, device drivers and network programming. The c		
development process, upgrades of existing kernels, kernel booting, debugging using dynamic instrumentation, and techniques to guarantee portability. Specifics of kernel architecture			
		-	
	real-time operating systems are also discussed. Theoretical and general principles are demonstrated on the LINUX kernel. Within labs focused on development of LINUX kernel modules.	-	
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NI-SBF	System Security and Forensics	Z,ZK	5
Students will get	familiar with aspects of system security (principles of end station security, principles of security policies, security models, authenticat	ion concepts). Fur	thermore,
students will get familiar with forensic analysis as a tool for investigating security incidents (techniques used by malicious software/attackers and forensic analysis techniques and the			
	importance of operating system/operating system artifacts or file system for attack analysis and detection).		
NI-SCR	Statistical Analysis of Time Series	Z,ZK	5
	with the practical use of the basic time series modelling theory in engineering tasks, ranging from economics (stock exchange prices g of signals and processes) to computer networks (network components load, attacks detection). The students learn to select a conve		
	lyze its properties and processes) to computer networks (network components load, allacks detection). The students learn to select a convert Iyze its properties and use it for forecasting of future or intermediate values. The stress is put on understanding and adoption of the mai	-	
	s. Both the lab classes and the lectures exploit freely available software packages in order to provide easy and straightforward transfe		
	the academic to the real world.		Ū
NI-SIB	Network Security	Z,ZK	5
NI-SIM	Digital Circuit Simulation and Verification	Z,ZK	5
The aim of the cou	rse is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level	Modeling) levels a	and with the
	properties of proper tools. The course covers recent verification methods, too.		
NI-SLA	Sublinear algorithms	Z,ZK	5
	We will introduce three methods to tackle algorithms working in sublinear space.		-
NI-SWE	Semantic Web and Knowledge Graphs	Z,ZK	5
	learn the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web tect lelling, integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge	-	
practices for mod	quality assurance.	graphs and their s	ystematic
NI-SYP	Parsing and Compilers	Z,ZK	5
	upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va		
	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		
NI-TES	Systems Theory	Z,ZK	5
	d has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However		
	ensuring the correct behavior of a given system have become critical. A key technique for mastering this complexity is the usage of m		-
aspects of the syst	ems that are important for the task at hand, and automated tools for analyzing those models. This subject will present theory and alg the modeling and analysis of complex systems.	orithms that form ti	ne basis for
NI-TSP	Testing and Reliability	Z,ZK	5
	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre		-
-	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu		-
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-TSW	Software Product Development	KZ	4
	The course is presented in Czech.		
NI-UMI	Artificial intelligence	Z,ZK	5
The course covers	s search and inference algorithms in major formal paradigms used in artificial intelligence such as logic theories, constraint programm	ing and automated	d planning.
	The main principles and practical applications of discussed techniques will be illustrated.	774	-
NI-VCC	Virtualization and Cloud Computing n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	Z,ZK	5
e e	rtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	•	
	rameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti		-
	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in		-
	and development tools (Continuous integration and development).		
NI-VMM	Retrieval from Multimedia	Z,ZK	5
The student obtains	s general knowledge regarding interfaces of portals providing multimedia content, the principles of similarity search, the methods of feat	ure extraction from	multimedia
	objects, indexing, and structure of distributed search engines.		-
NIE-ADP	Architecture and Design patterns		5
	is course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysis as ues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowledge o		-
-	n the commonly used object-oriented design patterns that represent the best practices for solving common software design problems. I		
	the principles of software architecture design and analysis. This includes the classical architectural styles, component based systems	•	
	architectures used in large-scale distributed systems.		
NIE-AIB	Algorithms of Information Security	Z,ZK	5
-	equainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, stude		
principles of cryp	tographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware detec learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic syste		machine
NIE-AM1	Middleware Architectures 1	Z,ZK	5
	dy new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information syste		
	lication servers. The will also study principles and technologies for middleware focused on application integrations, asynchronous comm		
	of applications. This course replaces the course MIE-MDW.		
NIE-BKO	Error Control Codes	Z,ZK	5
The course expand	Is the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary mathen	natical theory and p	principles of
-	des and codes for the correction of multiple errors, clusters of errors and whole syllables (bytes). Students will also learn how to imple		ions and
	rections for different types of transmissions (parallel, serial) when storing data in memory and when transmitting over telecommunica		~
NIE-BVS	Embedded Security c knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of crypto	Z,ZK	5 in bardware
-	bedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources	- · ·	
	of computer systems.		
NIE-DSV	Distributed Systems and Computing	Z,ZK	5
	uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing		
channels. They lear	rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that s	upport high availal	bility of both
	data and services, and safety in case of failures.		

NIE-EHW	Embedded Hardware	Z,ZK	5
-	s basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is the		
systems, that profi	t from their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discussed, of internal communication, parallelism extraction and utilization in special structures and system architectures.	including standard	lized means
NIE-EPC	Effective C++ programming	Z,ZK	5
Students learn hov	v to use the modern features of contemporary versions of the C++ programming language for software development. The course focus		ng effectivity
	ficiency in the form of writing maintainable and portable source code and creating correct programs with low memory and processor t	-	
NIE-ESW	Embedded Software	Z,ZK	5
	e course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the ba		
in C language an	d code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing, up combined with artificial intelligence.	o to sophisticated t	lechniques
NIE-FME	Formal Methods and Specifications	Z,ZK	5
	to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some so		
	basic properties of software.		
NIE-GPU	GPU Architectures and Programming	Z,ZK	5
-	knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the CU		
which is already a v	widespread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical com	putational structure	es, students
	will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.	771	
NIE-HWB	Hardware Security les the knowledge needed for the analysis and design of computer systems security solutions. Students get an overview of safeguard	Z,ZK	5
-	hears. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Studen	-	-
-	yptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions	-	suge about
NIE-KRY	Advanced Cryptology	Z,ZK	5
Students will lear	n the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the	ne mathematical pr	rinciples of
random number	generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they c	an apply to the inte	egration of
	their own systems or to the creation of their own software solutions.		
NIE-MCC	Multicore CPU Computing	Z,ZK	5
-	cquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations on mu ad memory, which are today the most common computing nodes of powerful computer systems. Students will gain knowledge of archi	-	
-	p reduce the decrease in computing power due to the widening performance gap between the computational requirements of multi-cor		-
	throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications and the second		
NIE-MKY	Mathematics for Cryptology	Z,ZK	5
	deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In		
on the problem of	of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discre	-	roblem of
	factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on		-
NIE-MTI	Modern Internet Technologies	Z,ZK	5
Studente learn	- advanced networking technologies and protocols for both local area networks and wide area networks. They get acquisited with rout		
Students learn	advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with rout technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile	ing techniques and	
	technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile	ing techniques and security.	
NIE-NSS		ing techniques and security.	transfer 5
NIE-NSS Students will learn theory and entropy	technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Normalized Software Systems the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from engineering y from thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related issue	ing techniques and security. Such as stability for es occur in any give	transfer 5 from system en software
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NIE-TES Today, humankir	Systems Theory In the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). Howeve	Z,ZK	5 aging this
	ensuring the correct behavior of a given system have become critical. A key technique for mastering this complexity is the usage of m		
	tems that are important for the task at hand, and automated tools for analyzing those models. This subject will present theory and alg		-
	the modeling and analysis of complex systems.		
NIE-TSP	Testing and Reliability	Z,ZK	5
	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre		the help of
the intuitive path se	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu	ıilt-in-self-test equip	ment. They
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NIE-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gai	n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	l organizations. The	y will get
	rtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie		
performance pa	rameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology toda	ay for the
management of co	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in	n the use of modern	n integration
	and development tools (Continuous integration and development).		
UNI-ADS	Algorithms and data structures	Z,ZK	7
	the most basic of the efficient algorithms, data structures and graph theory that every computer scientist should know. As part of the ex-		
	ined algorithms for solving practical problems. Furthermore, students gain basic knowledge of the design and use of finite automata, i		s, the use of
	ntext-free grammars and the design and use of stack automata. They are introduced to the Turing machine and to the complexity clas		
UNI-DI1	Didactics of Informatics I	Z,ZK	6
	on the subjects General Pedagogy and General Didactics and applies the acquired knowledge to didactics in the field of informatics		
	get acquainted with the ways of theoretical teaching of information technologies and in connection with their practical practice and ve		-
UNI-DI2	Didactics of Informatics II	KZ	7
	on the subject Didactics of Informatics I and applies the knowledge to the practical use of evaluation tools for various types of tests Mood		
	prmatics), Progtest (programs in C/C++), LearnShell (bash scripts). Students learn to work with the tools, prepare/program examples		
Students get acqua	ainted and help with preparing real tests from selected topics, get acquainted and help with the preparation of programming competiti	ions for secondary	school. The
	course is significantly built on independent work and processing of semester project (this corresponds to the credit load).	-	0
UNI-DIP	Diploma Thesis		9 ra) in aludaa
The eaching is bas	ed on individual consultations with the supervisor of the thesis or another consultant (didactic part). The scope of the 9 ECTS lessons consultations, preparation of the theoretical part, practical part, writing and defence of the thesis before the commission.	(I.e. about 270 Hou	rs) includes
UNI-IB	Information security	Z,ZK	5
	the area of description of basic cryptographic schemes and also introduces students to the basics of network and system security. G		-
	curity, such as ethical hacking, penetration testing and malware. At the end of the course students are introduced to the issues of sec		
	web applications. Student learns how to avoid traps that can be set for users and thus basics of safe behavior of users and risk min		occurry of
UNI-MTUI	Modern technology and artificial intelligence	Z.ZK	5
	cquainted with selected tools that can be used for data acquisition and processing and subsequently for their analysis and visualization.	1 ' 1	-
-	ine learning and artificial intelligence will be explained. In the next part of the course, the acquired knowledge will be used to work wi	-	-
	data. In the last part of the course, students will get acquainted with the basics of robotics, especially agent systems and motion p	-	
UNI-PPP	Propedeutics of pedagogical practice	KZ	6
_	The course is focused on the preparation of students for lessons before teaching practice.	1 1	
UNI-PS	Computers and networks	Z,ZK	6
Students are gener	ally explained the principles of the internal organization and architecture of computer systems. Using simple examples, they will underst	and how a standard	d multi-core,
vector- and GPU-a	accelerated computer connected to the Internet processes, stores and sends data in a multi-user operating system. The work at the c	command-line level	penetrates
	the entire subject and will be explained continuously.	,	
UNI-RPP	Reflection of teaching practice	Z	3
	ocused subject, special attention will be paid to the joint search for suitable solutions to the most common difficulties of pedagogical p		
	n dynamic changes in contemporary education. Teaching mainly builds on the targeted building of a safe space to reflect one's own dis	-	-
and process emo	tions as well as challenging topics from practice, including presentation and communication of students' first pedagogical outputs. Pro	ocedures included:	structured
	discussion, feedback interviews and mentoring.		
UNI-SPD	Semester project for thesis	Z	3
	purse is to deepen standards and requirements for theses. It takes place mainly in the form of individual consultations with supervisor		•
-	ning of the course there is a block meeting with students, which introduces the student to the requirements for theses and the interco	-	
didactic issues. Id	otal burden in the range of 3 ECTS. The student prepares a research of resources according to the supervisor's request, chooses a n	nethod of work, or p	prepares a
UNI-SPP	separate chapter.	KZ	15
	Continuous teaching practice re practice, the student undergoes the propedeutic of the teaching practice. The first part of the direct practice includes, in particular,	1 1	15 particular
-	ocessing of hospitalization protocols. In the next part, students also directly enter the lessons and engage in activities related to the r		-
	ate in the direct teaching activity, of which 96 hours directly teach either alone or in a couple. Home preparation for teaching, protocol	-	
	450 hours is included in the 15 credits.	processing, etc., i.	0. a total of
UNI-TP	Computer technology	Z,ZK	6
	ally focuses on embedded systems and low-level software. It explains that the basis is the design of algorithms and their implementa		
	rd to limiting conditions (size, speed, reliability). Topics are discussed in an overview form and practiced on specific examples in the la		
are aimed at gettin	ng students acquainted with teaching methods, e.g. how to show that there is not only reconfigurable software (a program in rewritable	le memory) but also	o hardware
(FPGA). It demonstrates how to adapt tasks to the teaching of secondary school students and their expected knowledge, e.g. by means of it	nteractive tutorials.	
UNI-VSA	Development of SW applications	Z,ZK	6
	isist of topics devoted to methodology, SW systems architectures, technology platforms as well as support tools used in practice share	-	
-	ration / Continuous Delivery) tools, application repositories (Google Play, App Store, Github, Gitlab,). The space will also be devoted in		
and services provid	led to developers, often free of charge (cloud storage, bug logging, authentication/authorization using Google or Facebook accounts and o		rs/exercises
	are designed so that students can try out at least one of many possible ways of developing and deploying a simple SW application	ation.	

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-08-17, time 12:58.