Studijní plán

Název plánu: Master specialization Design and Programming of Embedded Systems, in English, 2021

Sou ást VUT (fakulta/ústav/další): Fakulta informa ních technologií Katedra: Obor studia, garantovaný katedrou: Úvodní stránka Garant oboru studia .: **Program studia: Informatics** Typ studia: Navazující magisterské prezen ní P edepsané kredity: 98 Kredity z volitelných p edm t : 22 Kredity v rámci plánu celkem: 120 Poznámka k plánu: The study plan is intended for those students who have been accepted to study since the academic year 2021/2022 // Garant: doc. Ing. Hana Kubátová CSc. . Guarantor: doc. Ing. Hana Kubátová, CSc., email: Hana.Kubatova@fit.cvut.cz

Název bloku: Povinné p edm ty programu Minimální po et kredit bloku: 63 Role bloku: PP

Kód skupiny: NIE-PP.21

Název skupiny: Compulsory Courses of Master Study Program, Version 2021 Podmínka kredity skupiny: V této skupin musíte získat 63 kredit Podmínka p edm ty skupiny: V této skupin musíte absolvovat 6 p edm t Kredity skupiny: 63

Poznámka ke skupině:

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Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
NIE-KOP	Combinatorial Optimization Petr Fišer, Jan Schmidt Petr Fišer Petr Fišer (Gar.)	Z,ZK	6	3P+1C	Z	PP
NIE-DIP	Diploma Project Robert Pergl Zden k Muziká	Z	30		L,Z	PP
NIE-MPR	Master Project Zden k Muziká Zden k Muziká (Gar.)	Z	7		Z,L	PP
NIE-MPI	Mathematics for Informatics Francesco Dolce Št pán Starosta Št pán Starosta (Gar.)	Z,ZK	7	3P+2C	Z	PP
NIE-PDP	Parallel and Distributed Programming Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	6	2P+2C	L	PP
NIE-VSM	Selected statistical Methods Petr Novák Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	7	4P+2C	L	PP

Charakteristiky p edmet této skupiny studijního plánu: Kód=NIE-PP.21 Název=Compulsory Courses of Master Study Program, Version 2021

NIE-KOP	Combinatorial Optimization	Z,ZK	6		
The students will gain	knowledge and understanding necessary deployment of combinatorial heuristics at a professional level. They will be able not	only to select and	implement but		
also to apply and eval	Late heuristics for practical problems.				
NIE-DIP	Diploma Project	Z	30		
NIE-MPR	Master Project	Z	7		
1. At the beginning of	the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial	tasks that should	be carried out		
during the semester. I	the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the	end of the semes	ter. 2. External		
Master these (MT) su	pervisor fills his/her assessment into the paper "Form to award assessment by an external Final theses (FT) supervisor" (for th	e courses BIE-BA	AP, MIE-MPR,		
MIE-DIP). Students, tl	ien, ensure that the assessment is registered into the information system (IS) by asking their internal FT opponent to award th	e assessment to	the IS based on		
the confirmation of the	external MT supervisor. In the case the FT opponent is external as well, the assessment will be registered to the IS by the he	ad of the departn	nent responsible		
for the topic of the MT	3. If the FT topic that the student has reserved is rather general, the immediate tasks the supervisor assigns to the student fo	r the upcoming se	mester should		
aim at fine-tuning the	FT topic so that the FTT will be complete and approvable at the end of the semester.				
NIE-MPI	Mathematics for Informatics	Z,ZK	7		
The course focuses or	selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-var	iate analysis, smo	oth optimization,		
and multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The last topic includes selected					
numerical algorithm and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focuses on clear presentation and					
argumentation.					

NIE-PDP Parallel and Distributed Programming Z,ZK 6 21st century in computer architectures is primarily influenced by the shift of the Moore's law into parallelization of CPUs at the level of computing cores. Parallel computing systems are becoming a ubiquitous commodity and parallel programming becomes the basic paradigm of development of efficient applications for these platforms. Students get acquainted with architectures of parallel and distributed computing systems, their models, theory of interconnection networks and collective communication operations, and languages and environments for parallel programming of shared and distributed memory computers. They get acquainted with fundamental parallel algorithms and on selected problems, they will learn the techniques of design of efficient and scalable parallel algorithms and methods of performance evaluation of their implementations. The course includes a semester project of practical programming in OpenMP and MPI for solving a particular nontrivial problem.								
NIE-VSM Selected statistical Methods Z,ZK 7 Summary of probability theory; Multivariate normal distribution; Entropy and its application to coding; Statistical tests: T-tests, goodness of fit tests, independence test; Random processes - stacionarity; Markov chains and limiting properties; Queuing theory								
Název bloku: Povinné p edm ty specializace Minimální po et kredit bloku: 35 Role bloku: PS								
Kód skupiny: NIE-NPVS-PS.21 Název skupiny: Compulsory Courses of Master Spec. Design and Programming of Embedded Systems, v. 2021, in Czech Podmínka kredity skupiny: V této skupin musíte získat 35 kredit Podmínka p edm ty skupiny: V této skupin musíte absolvovat 7 p edm t								
Kredity skupiny: 3	35							
Poznámka ke sku	ipině:							
Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role		
NIE-SIM	Digital Circuit Simulation and Verification Martin Kohlík Martin Kohlík Martin Kohlík (Gar.)	Z,ZK	5	2P+1C	L	PS		
NIE-EHW	Embedded Hardware Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+1C	Z	PS		
NIE-BVS	Embedded Security Martin Novotný Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	L	PS		
NIE-ESW	Embedded Software Hana Kubátová, Miroslav Skrbek Miroslav Skrbek Hana Kubátová (Gar.)	Z,ZK	5	2P+1C	Z	PS		
NIE-BKO	Error Control Codes Pavel Kubalík Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+1C	L	PS		
NIE-TES	Systems Theory Tomáš Kolárik, Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	Z	PS		
NIE-TSP	Testing and Reliability Petr Fišer Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	PS		
and Programming of I	net této skupiny studijního plánu: Kód=NIE-NPVS-PS.21 Náze Embedded Systems, v. 2021, in Czech	ev=Compulso	ory Cours	ses of Ma	aster Spe	c. Design		
Aim of the course is to acqua	gital Circuit Simulation and Verification aint the students with principles of digital circuit simulation at RTL (Register Transfer Le	evel) and TLM (Tr	ansaction Le		Z,ZK lg) levels and	5 d with the		
	e course covers today recent verification methods, too.			7	,ZK	5		
The course brings basic laws systems, that profit from their	s that govern digital design and basic techniques to use them. It deals with both large a r specialized structure for effective computation and acceleration. Design of fast custor arallelism extraction and utilization in special structures and system architectures.			s is the base	of advanced	d embedded		
NIE-BVS Embedded Security Z,ZK 5 Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of cryptographic primitives in hardware and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources for securing internal 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 basic techniques of programming in C language and code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing, up to sophisticated techniques combined with artificial intelligence.								
The course expands the basi linear, cyclic codes and code								
Today, humankind has the at complexity and of ensuring th aspects of the systems that a								
the modeling and analysis of NIE-TSP Tes	complex systems. sting and Reliability			Z	,ZK	5		

NIE-PDP

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 built-in-self-test equipment. They will be able to compute, analyze, and control the reliability and availability of the designed circuits.

Kód skupiny: NIE-NPVS-VS.21

Název skupiny: Elective Vocational Courses for Master Specialization Design and Programming of Embedded Systems

Podmínka kredity skupiny:

Podmínka p edm ty skupiny:

Kredity skupiny: 0

Poznámka ke skupině:

Compulsory courses of all specializations with the exception of this specialization.

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len) Vyu ující, auto i a garanti (gar.)	Zakon ení	Kredity	Rozsah	Semestr	Role
NIE-KRY	Advanced Cryptology Ji í Bu ek, Róbert Lórencz Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	V
NIE-PDB	Advanced Database Systems Martin Svoboda Martin Svoboda (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-PIS	Advanced Information Systems Petr Kroha, Petra Pavlí ková Petra Pavlí ková (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-AIB	Algorithms of Information Security Martin Jure ek, Róbert Lórencz Róbert Lórencz Martin Jure ek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-ADP	Architecture and Design patterns Ji í Borský Ji í Borský Filip K ikava (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-MVI	Computational Intelligence Methods Miroslav epek, Pavel Kordík Pavel Kordík Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-KOD	Data Compression Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-ADM	Data Mining Algorithms Pavel Kordík, Rodrigo Augusto Da Silva Alves Daniel Vašata Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-DSV	Distributed Systems and Computing Jan Jane ek, Pavel Tvrdík, Peter Macejko Peter Macejko Jan Jane ek (Gar.)	Z,ZK	5	2P+1C	z	V
NIE-EPC	Effective C++ programming Daniel Langr Daniel Langr (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-EVY	Efficient Text Pattern Matching Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-FME	Formal Methods and Specifications Stefan Ratschan Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-GPU	GPU Architectures and Programming Ivan Šime ek Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-GAK	Graph theory and combinatorics Tomáš Valla Tomáš Valla (Tomáš Valla (Gar.)	Z,ZK	5	2P+2C	L	V
NIE-HWB	Hardware Security Jií Bu ek Jií Bu ek Jií Bu ek (Gar.)	Z,ZK	5	2P+2C	L	V
NIE-MKY	Mathematics for Cryptology Martin Jure ek, Róbert Lórencz, Olha Jure ková Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	3P+1C	L	V
NIE-AM1	Middleware Architectures 1 Milan Doj inovski, Jaroslav Kucha, Tomáš Vitvar Jaroslav Kucha Tomáš Vitvar (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-MTI	Modern Internet Technologies Viktor erný, Alexandru Moucha Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-MCC	Multicore CPU Computing Daniel Langr, Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-SIB	Network Security Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-NON	Nonlinear Continuous Optimization and Numerical Methods Jaroslav Kruis Jaroslav Kruis (Gar.)	Z,ZK	5	2P+1C	Z,L	V
NIE-NSS	Normalized Software Systems Robert Pergl, Marek Suchánek Robert Pergl Robert Pergl (Gar.)	ZK	5	2P	L	V
NIE-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-REV	Reverse Engineering Josef Kokeš, Ji i Dostál Josef Kokeš Róbert Lórencz (Gar.)	Z,ZK	5	1P+2C	Z	V
NIE-SBF	System Security and Forensics Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	Z	V

NIE-NUR	User Interface Design Josef Pavlí ek Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-VCC	Virtualization and Cloud Computing Jan Fesl, Tomáš Vondra Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V

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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 kn		
random number generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which th	ey can apply to the	ntegration of
their own systems or to the creation of their own software solutions.		
NIE-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 data	tabase machines (so	called NoSQL
databases), with the related new data models (XML, graph databases, column databases) and languages for working with them (XQuery, XPath,	CYPHER, 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		iented company,
enterprise services and service solution of business logic. They get acquainted with these notions also for the other types of ISs. They learn about	t agility and adaptivi	ty and using of
artificial intelligence methods for implementation of these ideas in ISs. They understand modern object-oriented methodologies for modelling of bu	usiness processes, ł	ousiness 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
Studenti se seznámí s algoritmy bezpe ného generování klí a kryptografickým zpracováním chybových (nejen biometrických) dat. Dále se studer	nti seznámí s matem	atickými principy
kryptografických protokol (identifika ních, autentiza ních a podpisových schémat). Získají znalosti o metodách detekce malware a použití strojov	rého u ení v detek r	ich algoritmech.
Taktéž se seznámí s metodami vytvá ení steganografických záznam , s metodami pro jejich vyhledávání a s útoky na n .		
NIE-ADP Architecture and Design patterns	Z,ZK	5
The aim of this course is to provide students with practical knowledge of the basic principles of object-oriented design and its analysis, together with	1 '	-
questions and compromises associated with advanced software design. In the first part of the course, students will review and deepen their knowle	•	
and learn the most commonly used design patterns, which represent the best practices for solving typical software design problems. In the second		
introduced to the principles of design and analysis of software architecture including classical architectural designs, component systems and some		
large distributed systems. If you need to contact the teacher of NIE-ADP, please write an e-mail to Ing. Jiri Borsky borskjir@fit.cvut.cz		
	Z,ZK	5
		-
Students will understand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are	-	
to solving a wide range of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. So	ludents will learn not	w these methods
work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, etc.		
NIE-KOD Data Compression	Z,ZK	5
Students are introduced to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of	data compression n	nethods being
used in practice. The overview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition	, students learn the	fundamentals of
lossy data compression methods used in image, audio, and video compression.		
NIE-ADM Data Mining Algorithms	Z,ZK	5
The course focuses on algorithms used in the fields of machine learning and data mining. However, this is not an introductory course, and the stud	dents should know r	nachine learning
		iaoiniio ioainiig
basics. The emphasis is put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learning tasks (e.g., recommendation		-
basics. The emphasis is put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learning tasks (e.g., recommendation methods).		-
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methods). Distributed Systems and Computing Students are introduced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of com	on systems) and mo	dels (e.g., kernel 5 d communication
methods). NIE-DSV Distributed Systems and Computing	on systems) and mo	dels (e.g., kernel 5 d communication
methods). Distributed Systems and Computing Students are introduced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of com channels. They learn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms data and services, and safety in case of failures.	on systems) and mo	dels (e.g., kernel 5 d communication vailability of both
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NIE-AM1 Middleware Architectures 1	Z,ZK	5
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 c	ommunications and	d high 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	iting techniques ar	nd transfer
technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile security.		
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 o	-	
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		-
throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.	I-COTE OF OS and I	nemory interface
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	1 1	-
course explains basic pricipals of security monitoring, packet-based and flow-based analysis, in order to detect anomalies and suspicious network to		
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).		5
NIE-NON Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5
Students will be introduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such me	1 ' 1	-
will also learn the finite element method and the finite difference method used for solving ordinary and partial differential equations in engineering.	They will learn to s	olve systems of
linear algebraic equations that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to implement	ent these algorithm	ns sequentially
as well as in parallel.		
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 engine	ering, such as stab	ility from system
theory and entropy from thermodynamics. Students will understand a set of principles that indicate where violations of stability and entropy-related	issues occur in any	y given software
architecture. In the second part of the course, students learn how to construct software architectures using a set of 5 design patterns called element		•
functionality of information systems in terms of storing data, executing actions, workflows, connectors, and triggers, while handling violations of the stal	bility and entropy-re	elated principles.
This knowledge allows students to realize new levels of evolvability in software architectures.		_
NIE-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 various variants	and applications
of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing. NIE-REV Reverse Engineering	771/	5
NIE-REV Reverse Engineering Students will learn fundamentals of reverse engineering of computer software (methods of executing and initializing programs, organization of exec	Z,ZK	-
libraries). Special attention will be paid to C ++. Students will also become familiar with the principles of debugging tools, disassemblers and obfusc		
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, auti	1 ' 1	-
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-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	1 1	-
notions and procesures. 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. This
course replaces MIE-MDW.		
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 ar	nd organizations. T	hey will get
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to ef	ficiently operate ar	nd optimize the
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect		
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 mo	odern integration
and development tools (Continuous integration and development).		
Kód skupiny: NIE-V.21		
Název skupiny: Purely Elective Master Courses, Version 2021		
Podmínka kredity skupiny:		
POOLIIINKA KIEOIIV SKUDINU		

Podmínka kredity skupiny: Podmínka p edm ty skupiny: Kredity skupiny: 0 Poznámka ke skupině:

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NIE-BLO	Blockchain Josef Gattermayer, Róbert Lórencz, Jakub R ži ka, Marek Bielik Josef Gattermayer Róbert Lórencz (Gar.)	Z,ZK	5	1P+2C	Z	V
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	3P	L	V
NIE-CPX	Complexity Theory Dušan Knop	Z,ZK	5	3P+1C	Z	V
NIE-VYC	Computability Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
NIE-MVI	Computational Intelligence Methods Miroslav epek, Pavel Kordík Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	Z	V

NIE-ARI	Computer arithmetic Pavel Kubalík Pavel Kubalík Alois Pluhá ek (Gar.)	Z,ZK	4	2P+1C	Z,L	V
NIE-SCE1	Computer Engineering Seminar Master I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	v
NIE-SCE2	Computer Engineering Seminar Master II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	v
NI-DSW	Design Sprint Ond ej Brém, Michal Manda Michal Manda David Pešek (Gar.)	Z	2	30B	Z	v
NI-DID	Digital drawing Denisa S vová, Eliška Novotná Denisa S vová Denisa S vová (Gar.)	Z	2	4C	Z,L	v
NIE-EVY	Efficient Text Pattern Matching Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	Z	v
NI-GLR	Games and reinforcement learning Juan Pablo Maldonado Lopez	Z,ZK	4	2P+2C	L	v
NI-GRI	Grid Computing André Sopczak, Petr Fiedler Pavel Tvrdík André Sopczak (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	Z	v
NIE-DVG	Introduction to Discrete and Computational Geometry Maria Saumell Mendiola Maria Saumell Mendiola Maria Saumell Mendiola (Gar.)	Z,ZK	5	2P+1C	L	v
MIE-MZI	Mathematics for data science Št pán Starosta	Z,ZK	4	2P+1C	L	v
NIE-AM2	Middleware Architectures 2 Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-PAM	Parameterized Algorithms Ond ej Suchý	Z,ZK	4	2P+1C	L	v
NIE-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-ROZ	Pattern Recognition Michal Haindl	Z,ZK	5	2P+1C	Z	v
NIE-PML	Personalized Machine Learning Rodrigo Augusto Da Silva Alves Karel Klouda Rodrigo Augusto Da Silva Alves (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-AML	Pokro lié techniky strojového u ení Zden k Buk, Miroslav epek, Petr Šimánek, Rodrigo Augusto Da Silva Alves, Vojt ch Rybá Miroslav epek Miroslav epek (Gar.)	Z,ZK	5	2P + 1C	L	V
NIE-PDL	Practical Deep Learning Martin Barus, Yauhen Babakhin Karel Klouda Martin Barus (Gar.)	KZ	5	2P+1C	Z	V
NIE-VPR	Research Project Št pán Starosta Št pán Starosta Št pán Starosta (Gar.)	Z	5		Z,L	V
NIE-SWE	Semantic Web and Knowledge Graphs Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	Z	v
MI-SCE1	Seminá po íta ového inženýrství l Hana Kubátová	Z	4	2C	L,Z	V
NIE-HSC	Side-Channel Analysis in Hardware Vojt ch Miškovský, Petr Socha Vojt ch Miškovský Vojt ch Miškovský (Gar.)	Z,ZK	4	2P+2C	Z	V
NIE-DDW	Web Data Mining Milan Doj inovski Milan Doj inovski Milan Doj inovski (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-BPS	Wireless Computer Networks Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	4	2P+1C	L	V
MIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+1C	Z	V
	dmet této skupiny studijního plánu: Kód=NIE-V.21 Název=Purely	/ Elective Ma	aster Co		sion 202	15
to solving a wide range of p	he basic methods and techniques of computational intelligence, which are based on tradi problems. The subject is also devoted to modern neural networks and the ways in which th m to problems related to data extraction, management, intelligence in games and optimis	ey learn and neu	-	-		
NIE-EVY E	fficient Text Pattern Matching efficient algorithms for text pattern matching. They learn to use so called succinct data stru e knowledge in design of applications that utilize pattern matching.		ficient in bo		,ZK le and memo	5 ry complexit
NIE-SYP	Parsing and Compilers e knowledge of fundamentals of automata theory, formal language and formal translation th pduced to special applications of parsers, such as incremental and parallel parsing.	eories. Students	gain knowle		,ZK s variants an	5 d application
NIE-BLO B	llockchain				,ZK	5
code and deploy a secure relationship between block	he foundations of blockchain technology, smart contract programming, and gain an overvie decentralized application, and assess whether integration of a blockchain is suitable for a cchains and information security. It is concluded with a defense of a research or applied s	a given problem.	The course	places an in	creased emp	hasis on the
	n of blockchain-based solutions in both academia and business.			Z	,ZK	5
	ss on compiler construction for bachelor students in computer science. The goal of the cla I implementation of programming languages. Seeing and actually understanding self-con		-	-	-	idents to

 understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class.

 NIE-CPX
 Complexity Theory
 Z,ZK
 5

 Students will learn about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the theory concerning practical (in)tractability of difficult problems.
 Image: Complexity Theory is a complexity theory and different models of algorithms and about implications of the theory concerning practical is a complexity theory is a complexity theory and different models of algorithms and about implications of the theory concerning practical is a complexity theory is a complexity theory and different models of algorithms and about implications of the theory concerning practical is a complexity theory i

NIE-VYC	Computability	Z,ZK	4
NIE-ARI	Computer arithmetic	Z,ZK	4
	bus data representations used in digital devices and will be able to design arithmetic operations implementation units.		
NIE-SCE1	Computer Engineering Seminar Master I	Z	4
	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistanc Jally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of t		
	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead		
semester.			
NIE-SCE2	Computer Engineering Seminar Master II	Z	4
	er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance		
	ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of t ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tead		
semester.			
NI-DSW	Design Sprint	Z	2
Studenti budou pracova	t metodou design sprint, vyvinutou p vodn spole ností Google, díky které lze b hem 5 dn p ejít od nápadu p es testování	až k finálnímu ná	ivrhu produktu
	rzu se seznámí s metodou Design Sprint z pohledu ú astníka. Na praktickém problému si vyzkouší celý 5ti denní proces od v átek semestru mají studenti možnost vyzkoušet si metodu, která vyžaduje kontinuáln jší asovou alokaci než b žná výuka.	výzkumu po testo	vání prototyp .
NI-DID	Digital drawing	Z	2
	j Digital Grawing žit student m základní principy digitální kresby a grafické tvorby. Studenti získají pov domí o základech kompozice, perspek	_	1
	h samostatných pracích. Studenti také získají zkušenosti s kresbou v pr b hu praktických cvi ení. Kurz je vhodný pro kohok		
	nou sou ástí výuky. P edm t bude organizovaný formou tematických cvi ení pokrývajících ást teorie a tv r ích cvi ení, která	á jsou zamena	na procvi ování.
NI-GLR	Games and reinforcement learning	Z,ZK	4
	nt learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intellig al and practical background so you can participate in related research activities. Presented in English.	gence. This course	is intended to
NI-GRI	Grid Computing	Z,ZK	5
	n knowledge about the world-wide network and computing infrastructure.	∠,∠IX	5
NIE-HMI	History of Mathematics and Informatics	Z,ZK	3
The course focuses on	selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer s	science The topic	s are selected
-	is between computer science and mathematical methods. Some examples of applications of mathematics to computer scienc		
NIE-DVG	Introduction to Discrete and Computational Geometry	Z,ZK	5
	troduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar v be able to solve simple algorithmic problems with a geometric component.	with the most fund	lamental notions
MIE-MZI	Mathematics for data science	Z,ZK	4
	ents are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used in		
-	gebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality prin	ciple, gradient me	ethods) and
	robability theory and statistics.		
NIE-AM2 Students will learn new	Middleware Architectures 2 trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architec	Z,ZK	5
	ibuted cache and databases, smart contracts, realtime communication and web security.	cures, concepts a	na technologies
NIE-PAM	Parameterized Algorithms	Z,ZK	4
	ation problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often nece		
	vill demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often o		
	s from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity expo input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomia		
	the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent soluti		
plethora of parameterize	ed algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorithm (presumably) does	s not exist. We
	e relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes.		
NIE-ROZ	Pattern Recognition s to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the s	Z,ZK	5 h to pottorn
	ill learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, ar		-
NIE-PML	Personalized Machine Learning	Z,ZK	5
	earning (PML) is a sub-field of machine learning that aims to create models and predictions based on the unique characteris		
	ommonly used in applications such as recommender systems, which recommend items to users based on their personal inter fields including advection are disingly and the mindle arise size of the source way will we leave the latest DMI methods from the		
-	fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from the ly, we will focus on cutting-edge models that are of interest to both the research and commercial communities.	eoretical, algorithr	nic, and practical
NI-AML	Pokro ilé techniky strojového u ení	Z,ZK	5
	identy s vybranými pokro ilými tématy strojového u ení a um lé inteligence a jejich aplikace na reálné problémy. Témata p ed	· ·	1
doporu ovacích systém	, zpracování obrazu, ízení i propojení fyzikálních zákon s oblastí strojového u ení. Cílem cvi ení je podrobn seznámit st		ými metodami.
NIE-PDL	Practical Deep Learning	KZ	5
-	I to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine I develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in fields su	-	-
language processing.			
NIE-VPR	Research Project	Z	5
Student obtains the creater	dits for published scientific outputs. The details are at https://courses.fit.cvut.cz/NI-VPR/en.		
NIE-SWE	Semantic Web and Knowledge Graphs	Z,ZK	5
	the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web to	-	
quality assurance.	integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledg	e graphs and the	systematic
MI-SCE1	Seminá po íta ového inženýrství l	Z	4
	nženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odoln		-
-	edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitel		
v deckými lánky a jino nová.	u odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíra	ina témata jsou pr	o każdý semestr
nova.			

NIE-HSC	Side-Channel Analysis in Hardware	Z,ZK	4			
This course is dedicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attacks. Students get familiar with						
various kinds of side cha	annels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks ar	nd get familiar with	n higher-order			
attacks. They also get p	ractice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel inform	ation leakage.				
NIE-DDW	Web Data Mining	Z,ZK	5			
Students will learn lates	t methods and technologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gain	an overview of W	leb mining			
techniques for Web craw	ling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an over	rview of most rece	ent developments			
in the field of social web	and recommendation systems.					
NIE-BPS	Wireless Computer Networks	Z,ZK	4			
Students will learn about	t the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in	ad-hoc networks,	multicast and			
broadcast mechanisms,	and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get know	wledge of security	/ mechanisms			
for wireless networks ar	d get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools.					
MIE-SEP	World Economy and Business	Z,ZK	4			
The course introduces s	The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy.					
Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic						
development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to						
take bachelor level of th	is course BIE-SEP as a prerequisite.					

Seznam p edm t tohoto pr chodu:

Kód	Název p edm tu	Zakon ení	Kredity
BIE-CCN	Compiler Construction	Z,ZK	5
This is an introdu	actory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for st	udents to
understa	nd the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching	theme of the class	s.
MI-SCE1	Seminá po íta ového inženýrství l	Z	4
Seminá po íta ov	ého inženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odolnost	i proti poruchám a	útok m. Ke
student m se v rán	nci p edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitelem.	. Sou ástí p edm t	u je práce s
v deckými lánky a	jinou odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíraná nová.	témata jsou pro ka	ždý semestr
MIE-MZI	Mathematics for data science	Z,ZK	4
	students are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used in da	ata science. The st	udied topics
include mainly: li	near algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality princ selected notions from probability theory and statistics.	ciple, gradient meth	nods) and
MIE-SEP	World Economy and Business	Z,ZK	4
The course introde	uces students of technical university to the international business. It does that predominantly by comparing individual countries and k	ey regions of world	d economy.
Students get to	know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor	n, corruption and e	economic
development, whic	h are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indiv	vidual readings. It is	s advised to
	take bachelor level of this course BIE-SEP as a prerequisite.		
NI-AML	Pokro ilé techniky strojového u ení	Z,ZK	5
	imuje studenty s vybranými pokro ilými tématy strojového u ení a um lé inteligence a jejich aplikace na reálné problémy. Témata p e		
doporu ovacích sy	vstém, zpracování obrazu, ízení i propojení fyzikálních zákon s oblastí strojového u ení. Cílem cvi ení je podrobn seznámit stud	enty s probíranými	metodami.
NI-DID	Digital drawing	Z	2
	l p iblížit student m základní principy digitální kresby a grafické tvorby. Studenti získají pov domí o základech kompozice, perspektiv	-	
	e svých samostatných pracích. Studenti také získají zkušenosti s kresbou v pr b hu praktických cvi ení. Kurz je vhodný pro kohokoli		
	edílnou sou ástí výuky. P edm t bude organizovaný formou tematických cvi ení pokrývajících ást teorie a tv r ích cvi ení, která js	-	
NI-DSW	Design Sprint	Z	2
	acovat metodou design sprint, vyvinutou p vodn spole ností Google, díky které lze b hem 5 dn p ejít od nápadu p es testování až		
	m kurzu se seznámí s metodou Design Sprint z pohledu ú astníka. Na praktickém problému si vyzkouší celý 5ti denní proces od výz		prototyp.
	íky za azení p ed za átek semestru mají studenti možnost vyzkoušet si metodu, která vyžaduje kontinuáln jší asovou alokaci než t		
NI-GLR	Games and reinforcement learning	Z,ZK	4
I he field of reinfor	cement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligen		intended to
	give you both theoretical and practical background so you can participate in related research activities. Presented in Englis		_
NI-GRI	Grid Computing	Z,ZK	5
	Grid computing and gain knowledge about the world-wide network and computing infrastructure.	7 71/	-
NIE-ADM	Data Mining Algorithms	Z,ZK	5
	s on algorithms used in the fields of machine learning and data mining. However, this is not an introductory course, and the students		-
basics. The empha	sis is put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learning tasks (e.g., recommendation sys methods).	tems) and models	(e.g., kernei
NIE-ADP	Architecture and Design patterns	Z,ZK	5
	rse is to provide students with practical knowledge of the basic principles of object-oriented design and its analysis, together with an ur		
	promises associated with advanced software design. In the first part of the course, students will review and deepen their knowledge of	, ,	° °
	commonly used design patterns, which represent the best practices for solving typical software design problems. In the second part		
introduced to the pr	rinciples of design and analysis of software architecture including classical architectural designs, component systems and some adva		nitectures of
	large distributed systems. If you need to contact the teacher of NIE-ADP, please write an e-mail to Ing. Jiri Borsky borskjir@fit.c	vut.cz	

NIE-AIB	Algorithms of Information Security	Z,ZK	5
	ní s algoritmy bezpe ného generování klí a kryptografickým zpracováním chybových (nejen biometrických) dat. Dále se studenti sez		
kryptografických pi	otokol (identifika ních, autentiza ních a podpisových schémat). Získají znalosti o metodách detekce malware a použití strojového u Taktéž se seznámí s metodami vytvá ení steganografických záznam, s metodami pro jejich vyhledávání a s útoky na n		algoritmech.
NIE-AM1	Middleware Architectures 1	Z,ZK	5
Students will stu	dy new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information systemetry of the area of service-oriented architectures.		eb service
architecture and ap	lication servers. The will also study principles and technologies for middleware focused on application integrations, asynchronous comm	nunications and hig	h availability
	of applications. This course replaces the course MIE-MDW.		
NIE-AM2	Middleware Architectures 2	Z,ZK	5
Students will learn	new trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architectur for microservices, distrubuted cache and databases, smart contracts, realtime communication and web security.	es, concepts and te	ecnnologies
NIE-ARI	Computer arithmetic	Z,ZK	4
	Students will learn various data representations used in digital devices and will be able to design arithmetic operations implementa		4
NIE-BKO	Error Control Codes	Z,ZK	5
-	Is the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary mather		-
	des and codes for the correction of multiple errors, clusters of errors and whole syllables (bytes). Students will also learn how to imple rrections for different types of transmissions (parallel, serial) when storing data in memory and when transmitting over telecommunica		ions and
NIE-BLO	Blockchain	Z,ZK	5
	stand the foundations of blockchain technology, smart contract programming, and gain an overview of most notable blockchain platfor	· · ·	-
	secure decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course places	-	-
	en blockchains and information security. It is concluded with a defense of a research or applied semester project, which prepares the	-	
	supervising implementation of blockchain-based solutions in both academia and business.		
NIE-BPS	Wireless Computer Networks	Z,ZK	4
Students will lear	n about the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in ac	I-hoc networks, mu	lticast and
broadcast mecha	nisms, and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get knowl for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suital	• •	echanisms
NIE-BVS	Embedded Security	Z,ZK	5
	c knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of crypt		-
-	nbedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resource		
	of computer systems.	771	<i>г</i>
NIE-CPX Students will lea	Complexity Theory In about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the	Z,ZK	5 n practical
	(in)tractability of difficult problems.	e theory concerning	y practical
NIE-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	· · ·	-
	crawling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an overvie		-
		w of most recent de	evelopments
	in the field of social web and recommendation systems.		evelopments
NIE-DIP		Z	30
NIE-DSV	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing	Z Z,ZK	30 5
NIE-DSV Students are introd	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing	Z Z,ZK processes and con	30 5 nmunication
NIE-DSV Students are introd	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that as	Z Z,ZK processes and con	30 5 nmunication
NIE-DSV Students are introd channels. They lea	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures.	Z Z,ZK processes and con support high availat	30 5 nmunication bility of both
NIE-DSV Students are introd channels. They lea NIE-DVG	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures. Introduction to Discrete and Computational Geometry	Z Z,ZK processes and con support high availat Z,ZK	30 5 nmunication bility of both 5
NIE-DSV Students are introd channels. They lea NIE-DVG	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures. Introduction to Discrete and Computational Geometry s to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with	Z Z,ZK processes and con support high availat Z,ZK	30 5 nmunication bility of both 5
NIE-DSV Students are introd channels. They lea NIE-DVG The course intends	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures. Introduction to Discrete and Computational Geometry to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with of this discipline, and to be able to solve simple algorithmic problems with a geometric component.	Z Z,ZK processes and con support high availal Z,ZK the most fundame	30 5 nmunication bility of both 5 ntal notions
NIE-DSV Students are introd channels. They lea NIE-DVG The course intends NIE-EHW	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures. Introduction to Discrete and Computational Geometry s to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with	Z Z,ZK processes and con support high availal Z,ZK the most fundame Z,ZK	30 5 nmunication bility of both 5 ental notions 5
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NIE-DSV Students are introd channels. They lea NIE-DVG The course intends NIE-EHW The course brings	in the field of social web and recommendation systems. Diploma Project Distributed Systems and Computing uced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing rn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that a data and services, and safety in case of failures. Introduction to Discrete and Computational Geometry to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with of this discipline, and to be able to solve simple algorithmic problems with a geometric component. Embedded Hardware 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	Z Z,ZK processes and con support high availal Z,ZK the most fundame Z,ZK base of advanced	30 5 nmunication bility of both 5 ental notions 5 embedded
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NIE-HMI	History of Mathematics and Informatics	Z,ZK	3
	es on selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer sc		
	come relations between computer science and mathematical methods. Some examples of applications of mathematics to computer science		
NIE-HSC	Side-Channel Analysis in Hardware edicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attac	Z,ZK	4 milior with
	ide channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and	-	
	They also get practice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel	-	-
NIE-HWB	Hardware Security	Z,ZK	5
The course provid	es the knowledge needed for the analysis and design of computer systems security solutions. Students get an overview of safeguard	s against abuse of	the system
using hardware m	neans. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Stude	nts will gain knowle	edge about
	yptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions		
NIE-KOD	Data Compression	Z,ZK	5
	bduced to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of data he overview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition, study	-	-
	lossy data compression methods used in image, audio, and video compression.		amentais of
NIE-KOP	Combinatorial Optimization	Z,ZK	6
	gain knowledge and understanding necessary deployment of combinatorial heuristics at a professional level. They will be able not onl		-
	also to apply and evaluate heuristics for practical problems.		
NIE-KRY	Advanced Cryptology	Z,ZK	5
Students will learn	n the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know t	he mathematical pi	rinciples of
random number g	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.	7 71/	-
NIE-MCC	Multicore CPU Computing cquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations on mu	Z,ZK	5 with shared
°	d memory, which are today the most common computing nodes of powerful computer systems. Students will gain knowledge of archi	•	
	preduce 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 application	ations.	
NIE-MKY	Mathematics for Cryptology	Z,ZK	5
	ubší znalosti o algebraických postupech ešících nejd ležit jší matematické problémy, na kterých je založena bezpe nost šifer. Zejmé		
soustavy polynom	iálních rovníc nad kone ným t lesem, problém faktorizace velkých ísel a problém diskrétního logaritmu. Problém faktorizace bude s	peciáln ešen i na	a eliptických
	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce.	771	7
NIE-MPI	Mathematics for Informatics s on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate	Z,ZK	7
	integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The	-	-
	Im and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus	-	
		ses on clear preser	ntation and
	argumentation.	ses on clear preser	ntation and
NIE-MPR	argumentation. Master Project	Z	7
NIE-MPR 1. At the beginning	argumentation. Master Project g of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial ta	Z sks that should be	7 carried out
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will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximatio	esumably) does no n schemes.	t exist. We
NIE-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 databas	1 / 1	led NoSQL
databases), with the related new data models (XML, graph databases, column databases) and languages for working with them (XQuery, XPath, CYPH	HER, Gremlin). The	last part of
the course deals with performance evaluation of database machines. This course is equivalent to the course MIE-PDB.	1/7	_
NIE-PDL Practical Deep Learning This course is designed to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine learning	KZ	5 Throughout
the course, students will develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in fields such	-	-
language processing.	•	
NIE-PDP Parallel and Distributed Programming	Z,ZK	6
21st century in computer architectures is primarily influenced by the shift of the Moore's law into parallelization of CPUs at the level of computing core		
are becoming a ubiquitous commodity and parallel programming becomes the basic paradigm of development of efficient applications for these platfo	-	-
with architectures of parallel and distributed computing systems, their models, theory of interconnection networks and collective communication ope environments for parallel programming of shared and distributed memory computers. They get acquianted with fundamental parallel algorithms and out		•
learn the techniques of design of efficient and scalable parallel algorithms and methods of performance evaluation of their implementations. The course	-	-
practical programming in OpenMP and MPI for solving a particular nontrivial problem.	·	
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 notic		
enterprise services and service solution of business logic. They get acquainted with these notions also for the other types of ISs. They learn about agil artificial intelligence methods for implementation of these ideas in ISs. They understand modern object-oriented methodologies for modelling of busines		-
processed data, and enterprise ISs. They will get the rules and technologies for successful implementation of IS.		
NIE-PML Personalized Machine Learning	Z,ZK	5
Personalized machine learning (PML) is a sub-field of machine learning that aims to create models and predictions based on the unique characteristic		
entities. While PML is commonly used in applications such as recommender systems, which recommend items to users based on their personal interes	· · ·	
to a wide range of other fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from theore perspectives. Specifically, we will focus on cutting-edge models that are of interest to both the research and commercial commu	-	ind practical
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 executa		-
libraries). Special attention will be paid to C ++. Students will also become familiar with the principles of debugging tools, disassemblers and obfuscation	on methods. Finally,	the course
will focus on code compression and decompression and executable file reconstruction.		
NIE-ROZ Pattern Recognition	Z,ZK	5
The aim of the module is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the si recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, a		-
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, authent	· · ·	-
also learn about forensic analysis as a tool for investigating security incidents (techniques used by malicious software or attackers, forensic analysis te	chniques, and the i	mportance
of memory or file system artifacts for attack analysis and detection).		
NIE-SCE1 Computer Engineering Seminar Master I	Z	4 Studente
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance t are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the		ks. Sludenis
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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 organizations. They will get						
acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiently operate and optimize the						
performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effective technology today for the						
management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in the use of modern integration						
and development tools (Continuous integration and development).						
NIE-VPR	Research Project	Z	5			
Student obtains the credits for published scientific outputs. The details are at https://courses.fit.cvut.cz/NI-VPR/en.						
NIE-VSM	Selected statistical Methods	Z,ZK	7			
Summary of probability theory; Multivariate normal distribution; Entropy and its application to coding; Statistical tests: T-tests, goodness of fit tests, independence test; Random processes						
- stacionarity; Markov chains and limiting properties; Queuing theory						
NIE-VYC	Computability	Z,ZK	4			

Aktualizace výše uvedených informací naleznete na adrese <u>http://bilakniha.cvut.cz/cs/FF.html</u> Generováno: dne 27.07.2024 v 11:01 hod.