Studijní plán

Název plánu: Master specialization Computer Systems and Networks, 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. Guarantor: prof. Ing. Pavel Tvrdík, CSc., email: pavel.tvrdik@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:

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 Thesis Zden k Muziká Zden k Muziká (Gar.)	Z	30	270ZP	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 (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 I	nowledge and understanding necessary deployment of combinatorial heuristics at a professional level. They will be able not	only to select and	I implement but
also to apply and evalu	ate heuristics for practical problems.		
NIE-DIP	Diploma Thesis	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. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end of the semester. 2. The external supervisor enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/student/studijni/formulare). The completed and signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic that the student has reserved is rather general, the immediate tasks the supervisor assigns to the student for the upcoming semester 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 on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate analysis, smooth 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 acquianted 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-PSS-PS.21

Název skupiny: Compulsory Courses of Master Specialization Computer Systems and Networks, version

2021

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: 35 Poznámka ke skupině:

POZNANIKA K	•					
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-DSV	Distributed Systems and Computing Pavel Tvrdík, Peter Macejko Peter Macejko Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1C	Z	PS
NIE-EPC	Effective C++ programming Daniel Langr Daniel Langr (Gar.)	Z,ZK	5	2P+1C	Z	PS
NIE-GPU	GPU Architectures and Programming Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	L	PS
NIE-MTI	Modern Internet Technologies Viktor erný, Alexandru Moucha Alexandru Moucha (Gar.)	Z,ZK	5	2P+1C	Z	PS
NIE-MCC	Multicore CPU Computing Daniel Langr, Ivan Šime ek Ivan Šime ek (Gar.)	Z,ZK	5	2P+1C	Z	PS
NIE-SIB	Network Security Tomáš Zahradnický, Ji í Dostál, Simona Forn sek, Gramoz Cubreli Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	L	PS
NIE-VCC	Virtualization and Cloud Computing Tomáš Vondra Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	PS

Charakteristiky p edmet této skupiny studijního plánu: Kód=NIE-PSS-PS.21 Název=Compulsory Courses of Master Specialization Computer Systems and Networks, version 2021

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 compu	ting processes and	d communication
channels. They learn ba	sic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms th	at support high a	vailability of both
data and services, and	safety in case of failures.		
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 programming effectivity and efficiency in the form of writing maintainable and portable source code and creating correct programs with low memory and processor time requirements.

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 programming environment, which is already a widespread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical computational structures, students will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.

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 routing techniques and transfer

Students learn advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing techniques and 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 on multicore processors with shared and virtually shared memory, which are today the most common computing nodes of powerful computer systems. Students will gain knowledge of architecturally specific optimization techniques used to reduce the decrease in computing power due to the widening performance 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.

NIF-SIB Network Security 7.7K 5.

The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically about detection and defense. The course explains basic pricipals of security monitoring, packet-based and flow-based analysis, in order to detect anomalies and suspicious network traffic. The course focuses on explanation and practical examples of various mechanisms of securing network infrastructure and detection in real time. The course covers general principals of handling detected security events (i.e. incident handling and incident response).

NIE-VCC Virtualization and Cloud Computing

Z,ZK

.

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).

Název bloku: Volitelné p edm ty Minimální po et kredit bloku: 0

Role bloku: V

Kód skupiny: NIE-PSS-VS.21

Název skupiny: Elective Vocational Courses for Master Specialization Computer Systems and Networks

Podmínka kredity skupiny: Podmínka p edm ty skupiny:

Kredity skupiny: 0 Poznámka ke skupině:

Poznámka ke sk	•					
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 Petr Kroha (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-AIB	Algorithms of Information Security Martin Jure ek Martin Jure ek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-ADP	Architecture and Design patterns Ji í Borský, Jan Kurš, Jan Zimolka, Marek B lohoubek Jan Kurš Jan Kurš (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-MVI	Computational Intelligence Methods Miroslav epek, Pavel Kordík Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-KOD	Data Compression Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-ADM	Data Mining Algorithms Rodrigo Augusto Da Silva Alves Rodrigo Augusto Da Silva Alves Pavel Kordík (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-SIM	Digital Circuit Simulation and Verification Martin Kohlik Martin Kohlik Martin Kohlik (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-EVY	Efficient Text Pattern Matching Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-EHW	Embedded Hardware Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-BVS	Embedded Security Ji í Bu ek, Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	L	V
NIE-ESW	Embedded Software Hana Kubátová, Miroslav Skrbek Miroslav Skrbek Hana Kubátová (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-BKO	Error Control Codes Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-FME	Formal Methods and Specifications Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-GAK	Graph theory and combinatorics Michal Opler Tomáš Valla Tomáš Valla (Gar.)	Z,ZK	5	2P+2C	L	V
NIE-HWB	Hardware Security Ji í Bu ek Ji í 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 Tomáš Vitvar, Milan Doj inovski, Jaroslav Kucha Jaroslav Kucha Tomáš Vitvar (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-SIB	Network Security Tomáš Zahradnický, Ji í Dostál, Simona Forn sek, Gramoz Cubreli Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	L	V
NIE-NON	Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5	2P+1C	Z,L	V
NIE-NSS	Normalized Software Systems Jan Verelst, Robert Pergl, Marek Suchánek Robert Pergl Robert Pergl (Gar.)	ZK	5	2P	L	V
NIE-OSY	Operating Systems and Systems Programming Petr Zemánek Petr Zemánek (Gar.)	Z,ZK	5	2P+1C	Z	V

NIE-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-REV	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
NIE-SBF	System Security and Forensics Tomáš Zahradnický, Ji í Bu ek, Simona Forn sek, Marián Svetlík Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+1C	Z	٧
NIE-TES	Systems Theory Tomáš Kolárik, Stefan Ratschan, Ji í Vysko il Stefan Ratschan Stefan Ratschan (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-TSP	Testing and Reliability Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
NIE-NUR	User Interface Design Josef Pavlí ek Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+1C	Z	V

Charakteristiky p edmet této skupiny studijního plánu: Kód=NIE-PSS-VS.21 Název=Elective Vocational Courses for Master Specialization **Computer Systems and Networks**

NIE-SIB Network Security Z,ZK

The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically about detection and defense. The course explains basic pricipals of security monitoring, packet-based and flow-based analysis, in order to detect anomalies and suspicious network traffic. The course focuses on explanation and practical examples of various mechanisms of securing network infrastructure and detection in real time. The course covers general principals of handling detected security events (i.e. incident handling and incident response).

NIE-KRY Advanced Cryptology

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.

NIF-PDB Advanced Database Systems

Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of database 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

Students learn the notion of business process logic and its formalization, with business process roles, business rules, and data processing, with the notion of service oriented 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 agility and adaptivity and using of artificial intelligence methods for implementation of these ideas in ISs. They understand modern object-oriented methodologies for modelling of business processes, business rules, processed data, and enterprise ISs. They will get the rules and technologies for successful implementation of IS.

Algorithms of Information Security

Studenti se seznámí s algoritmy bezpe ného generování klí a kryptografickým zpracováním chybových (nejen biometrických) dat. Dále se studenti seznámí s matematickými principy kryptografických protokol (identifika ních, autentiza ních a podpisových schémat). Získají znalosti o metodách detekce malware a použití strojového u ení v detek ních 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

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 an understanding of the challenges, questions and compromises associated with advanced software design. In the first part of the course, students will review and deepen their knowledge of object-oriented programming and learn the most commonly used design patterns, which represent the best practices for solving typical software design problems. In the second part of the course, students will be introduced to the principles of design and analysis of software architecture including classical architectural designs, component systems and some advanced software architectures 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.cvut.cz

NIE-MVI Computational Intelligence Methods Z.ZK

5

Students will understand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallel in nature and are applicable 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. Students will learn how 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 methods 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.

Data Mining Algorithms NIF-ADM

Z,ZK

The course focuses on algorithms used in the fields of machine learning and data mining. However, this is not an introductory course, and the students should know machine learning basics. The emphasis is put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learning tasks (e.g., recommendation systems) and models (e.g., kernel methods)

NIE-SIM Digital Circuit Simulation and Verification

Efficient Text Pattern Matching

Z,ZK

Aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers today recent verification methods, too.

NIF-FVY

Z.ZK

5

Students get knowledge of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient in both access time and memory complexity. They will be able to use the knowledge in design of applications that utilize pattern matching.

NIE-EHW **Embedded Hardware**

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 advanced embedded systems, that profit from their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discussed, including standardized means of internal communication, parallelism extraction and utilization in special structures and system architectures.

NIE-BVS Embedded Security

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 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. Error Control Codes The course expands the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary mathematical theory and principles of linear, cyclic codes and codes for the correction of multiple errors, clusters of errors and whole syllables (bytes). Students will also learn how to implement these detections and corrections for different types of transmissions (parallel, serial) when storing data in memory and when transmitting over telecommunication channels. Formal Methods and Specifications Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some software tools that allow to prove basic properties of software NIE-GAK Graph theory and combinatorics Z,ZK The goal of the class is to introduce the most important topics in graph theory, combinatorics, combinatorial structures, discrete models and algorithms. The emphasis will be not only on undestanding the basic principles but also on applications in problem solving and algorithm design. The topics include: generating functions, selected topics from graph and hypergraph coloring, Ramsey theory, introduction to probabilistic method, properties of various special classes of graphs and combinatorial structures. The theory will be also applied in the fields of combinatorics on words, formal languages and bioinformatics. 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 safeguards against abuse of the system using hardware means. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Students will gain knowledge about the cryptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions of the computer. NIE-MKY Mathematics for Cryptology Studenti získají hlubší znalosti o algebraických postupech ešících nejd ležit jší matematické problémy, na kterých je založena bezpe nost šifer. Zejména se jedná o problém ešení soustavy polynomiálních rovníc nad kone ným t lesem, problém faktorizace velkých ísel a problém diskrétního logaritmu. Problém faktorizace bude speciáln ešen i na eliptických k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. NIE-AM1 Z.ZK Middleware Architectures 1 Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information system architecture. web service architecture and aplication servers. The will also study principles and technologies for middleware focused on application integrations, asynchronous communications and high availability of applications. This course replaces the course MIE-MDW. Nonlinear Continuous Optimization and Numerical Methods Z.ZK Students will be introduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such methods to real-world problems. They 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 solve systems of linear algebraic equations that arise from discretization of the continuous problems by direct and iterative algorithms. They will also learn to implement these algorithms sequentially as well as in parallel NIE-NSS Normalized Software Systems ΖK 5 Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from engineering, such as stability 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 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 elements. These elements provide the core functionality of information systems in terms of storing data, executing actions, workflows, connectors, and triggers, while handling violations of the stability and entropy-related principles. This knowledge allows students to realize new levels of evolvability in software architectures. NIE-OSY Operating Systems and Systems Programming Z.ZK This course is focused on the design and implementation of the basic components that make up modern operating systems. This includes threads, processes, switching context, virtual memory, system calls, interrupts and interactions of SW and HW using drivers. Students will learn the theory of the concept of operating system architecture with emphasis on the kernel architecture. Within the course, they will gain practical experience with the development of a small but fully functional operating system. Parsing and Compilers Z,ZK 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 Z,ZK Students will learn fundamentals of reverse engineering of computer software (methods of executing and initializing programs, organization of executable files, work with third-party libraries). Special attention will be paid to C++. Students will also become familiar with the principles of debugging tools, disassemblers and obfuscation methods. Finally, the course will focus on code compression and decompression and executable file reconstruction. NIE-SBF System Security and Forensics Z,ZK Students will be introduced to various aspects of system security (principles of endpoint security, principles of security policies, security models, authentication concepts). Students will also learn about forensic analysis as a tool for investigating security incidents (techniques used by malicious software or attackers, forensic analysis techniques, and the importance of memory or file system artifacts for attack analysis and detection). NIE-TES Systems Theory Z,ZK Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However, the costs of managing 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 models that describe 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 form 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 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.

notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs. This course replaces MIE-MDW.

NIE-NUR

Kód skupiny: NIE-V.21 Název skupiny: Purely elective master's courses

User Interface Design

Podmínka kredity skupiny:

Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental

Z,ZK

5

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

Kód	Název p edm tu / Název skupiny p edm t (u skupiny p edm t seznam kód jejích len)	Zakon ení	Kredity	Rozsah	Semestr	Role
	Vyu ující, auto i a garanti (gar.)		,			
NIE-BLO	Blockchain Josef Gattermayer, Jakub R ži ka, Marek Bielik Josef Gattermayer Josef Gattermayer (Gar.)	Z,ZK	5	1P+2C	Z	V
NIE-CPX	Complexity Theory Ond ej Suchý Dušan Knop Ond ej Suchý (Gar.)	Z,ZK	5	3P+1C	Z	V
NIE-VYC	Computability 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 (Gar.)	Z,ZK	4	2P+1C	Z,L	V
NIE-SCE1	Computer Engineering Seminar Master I 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 Nová ková Denisa Nová ková Denisa Nová ková (Gar.)	Z	2	4C	Z,L	V
NIE-EVY	Efficient Text Pattern Matching 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 (Gar.)	Z,ZK	5	2P+1C	L	V
FITE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	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-OSY	Operating Systems and Systems Programming Petr Zemánek Petr Zemánek (Gar.)	Z,ZK	5	2P+1C	Z	V
NIE-PAM	Parameterized Algorithms Ond ej Suchý Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	4	2P+1C	L	V
NIE-SYP	Parsing and Compilers Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	٧
NIE-ROZ	Pattern Recognition Michal Haindl Michal Haindl (Gar.)	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 ilé 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 Karel Klouda (Gar.)	KZ	5	2P+1C	Z	V
FIT-ACM1	Programovací praktika 1 Tomáš Valla Tomáš Valla (Gar.)	KZ	5	4C	L	V
FIT-ACM2	Programovací praktika 2 Tomáš Valla Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
FIT-ACM3	Programovací praktika 3 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
FIT-ACM4	Programovací praktika 4 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	Z	V
FIT-ACM5	Programovací praktika 5 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
FIT-ACM6	Programovací praktika 6 Ond ej Suchý Ond ej Suchý (Gar.)	KZ	5	4C	L	V
NIE-VPR	Research Project 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 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 (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
NIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+1C	Z	V
FITE-SEP	World Economy and Business Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V

FITE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V
	Tomas Evan Tomas Evan Tomas Evan (Gal.)					
harakteristiky p	edmet této skupiny studijního plánu: Kód=NIE-V.21 Název=	Purely elective m	aster's c	ourses		
NIE-MVI	Computational Intelligence Methods			Z	,ZK	5
	d the basic methods and techniques of computational intelligence, which are basec		-	-		
	of problems. The subject is also devoted to modern neural networks and the ways in	•	uroevolution	. Students will	l learn how th	nese metho
	them to problems related to data extraction, management, intelligence in games an	d optimisation, etc.				
NIE-EVY	Efficient Text Pattern Matching				,ZK	5
	e of efficient algorithms for text pattern matching. They learn to use so called succinct the knowledge in design of applications that utilize pattern matching.	data structures that are e	efficient in be	oth access tim	e and memo	ry complex
VIE-OSY	Operating Systems and Systems Programming			7	,ZK	5
	Operating Systems and Systems Programming on the design and implementation of the basic components that make up modern op	perating eyetems. This inc	cludes three	1	<i>'</i>	_
	interrupts and interactions of SW and HW using drivers. Students will learn the theo	• •				
	hin the course, they will gain practical experience with the development of a small b	, , ,	0 ,			
NE-SYP	Parsing and Compilers			Z	,ZK	5
	the knowledge of fundamentals of automata theory, formal language and formal trans	slation theories. Students	gain knowle			_
	ntroduced to special applications of parsers, such as incremental and parallel parsing		•	ŭ		• •
NIE-BLO	Blockchain			Z	,ZK	5
tudents will understan	d the foundations of blockchain technology, smart contract programming, and gain a	an overview of most notab	ole blockcha	in platforms. T	hey will be a	able to desi
ode and deploy a secu	ure decentralized application, and assess whether integration of a blockchain is suit	able for a given problem.	The course	places an inc	creased emp	hasis on t
elationship between bl	ockchains and information security. It is concluded with a defense of a research or a	applied semester project	, which prep	ares the stud	ents for impl	ementing
upervising implementa	ation of blockchain-based solutions in both academia and business.					
IIE-CPX	Complexity Theory			Z	,ZK	5
	ut the fundamental classes of problems in the complexity theory and different mode	els of algoritms and about	t implication	s of the theor	y concernino	g practical
n)tractability of difficult	problems.					
IIE-VYC	Computability			Z	,ZK	4
lassical theory of recu	rrsive functions and effective computability.					
IIE-ARI	Computer arithmetic			Z	,ZK	4
tudents will learn vario	ous data representations used in digital devices and will be able to design arithmetic	c operations implementa	tion units.			
IIE-SCE1	Computer Engineering Seminar Master I				Z	4
•	ter Engineering is a (s)elective course for students who want to deal with deeper topi		-			
* *	ually within the subject. Each student or group of students solves some interesting t	•	-	-		
•	ssional literature and/or work in K N laboratories. The capacity of the subject is limit	ited by the possibilities of	f the semina	ar teachers. Th	ne topics are	new for ea
emester.	0					
IIE-SCE2	Computer Engineering Seminar Master II			- 1	Z	4
•	ter Engineering is a (s)elective course for students who want to deal with deeper topi		-			
	ually within the subject. Each student or group of students solves some interesting t	•	-	-		
emester.	ssional literature and/or work in K N laboratories. The capacity of the subject is limi	ited by the possibilities of	i ille sellille	ai teachers. II	ie topics are	ilew ioi e
II-DSW	Design Sprint				Z	2
_	Design Sprint at metodou design sprint, vyvinutou p vodn spole ností Google, díky které lze b h	nem 5 dn in eiít ad nána	du n ac tact	ı	_	_
·	rzu se seznámí s metodou Design Sprint z pohledu ú astníka. Na praktickém probl					-
	átek semestru mají studenti možnost vyzkoušet si metodu, která vyžaduje kontinuá				i po tootovai	пріостур
II-DID	Digital drawing	,	,		Z	2
	ן סוקונמו מומאיזוק ížit student m základní principy digitální kresby a grafické tvorby. Studenti získají po	ov domí o základech kor	mpozice, pe	1	- 1	
	ch samostatných pracích. Studenti také získají zkušenosti s kresbou v pr b hu prak					
likož práv to je nedíli	nou sou ástí výuky. P edm t bude organizovaný formou tematických cvi ení pokrýv	vajících ást teorie a tv r	ích cvi en	, která jsou za	am ena na	procvi ová
II-GLR	Games and reinforcement learning			Z	,ZK	4
he field of reinforceme	ent learning is very hot recently, because of advances in deep learning, recurrent ne	eural networks and gener	ral artificial	1	· 1	intended t
	al and practical background so you can participate in related research activities. Pre			Ü		
II-GRI	Grid Computing	•		Z	,ZK	5
_	in knowledge about the world-wide network and computing infrastructure.			' -	,	-
IIE-HMI	History of Mathematics and Informatics			7	,ZK	3
	selected topics from calculus, general algebra, number theory, numerical mathema	atics and logic - useful for	today com			
	ns between computer science and mathematical methods. Some examples of applie	=	-		-	
IIE-DVG	Introduction to Discrete and Computational Geometry		1		,ZK	5
	ntroduce the students to the discipline of Discrete and Computational Geometry. The	e main goal of the course	is to get far	1	, I	
	he able to solve simple algorithmic problems with a geometric component	. 5	321.00			

of this discipline, and to be able to solve simple algorithmic problems with a geometric component.

FITE-EHD	Introduction to European Economic History	Z,ZK	3
	selection of themes from European economic history. It gives the student basic knowledge about forming of the global econ		-
'	s European countries have been dominant actors in this process it focuses predominantly on their roles in economic history.	J	
· ·	e fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial he detailed economic history of particular European countries but rather the impact of trade and the role of particular events,		-
	will consist of a mixture of lectures and discussions.	institutions and c	nganizations in
MIE-MZI	Mathematics for data science	Z,ZK	4
	ints are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used it		· ·
include mainly: linear al	gebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality prin	nciple, gradient me	ethods) and
selected notions from p	robability theory and statistics.		
NIE-AM2	Middleware Architectures 2	Z,ZK	5
	trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architecture in the contract of the contra	ctures, concepts a	nd technologies
	buted cache and databases, smart contracts, realtime communication and web security.		
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	-	•
	s from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exp		
	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 solut		
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	not exist. We
	e relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes.		
NIE-ROZ	Pattern Recognition	Z,ZK	5
	s to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the s		-
	Il learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, a		
NIE-PML	Personalized Machine Learning	Z,ZK	5 of individual
	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 inte		
	fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from the		• •
_	y, we will focus on cutting-edge models that are of interest to both the research and commercial communities.	,	.,
NI-AML	Pokro ilé techniky strojového u ení	Z,ZK	5
P edm t seznamuje stu	denty s vybranými pokro ilými tématy strojového u ení a um lé inteligence a jejich aplikace na reálné problémy. Témata p e	'	v oblasti
doporu ovacích systém	, zpracování obrazu, ízení i propojení fyzikálních zákon s oblastí strojového u ení. Cílem cvi ení je podrobn seznámit st	udenty s probíran	ými metodami.
NIE-PDL	Practical Deep Learning	KZ	5
_	to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine	-	-
	develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in fields su	ich as computer v	ision and natural
language processing.	December of condition 4	1/7	_
FIT-ACM1	Programovací praktika 1	KZ	5
FIT-ACM2	za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	KZ	5
	Programovací praktika 2 za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	NZ	5
FIT-ACM3	Programovací praktika 3	KZ	5
	za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	112	0
FIT-ACM4	Programovací praktika 4	KZ	5
	za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	1	-
FIT-ACM5	Programovací praktika 5	KZ	5
Tento výb rový kurz má	za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	ı	
FIT-ACM6	Programovací praktika 6	KZ	5
Tento výb rový kurz má	za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	'	•
NIE-VPR	Research Project	Z	5
	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
	he most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web to the course will provide an overview of the Semantic Web to the course will provide an overview of the Semantic Web.	_	
_ -	integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge	je grapns and the	ir systematic
quality assurance.	Cominá na íta aváha inžanýrství I	7	1
MI-SCE1	Seminá po íta ového inženýrství I nženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odoln	Z osti proti poruchá	4 maútok m Ke
· · · · · · · · · · · · · · · · · · ·	edm tu p istupuje individuáln a každý student i skupinka student eší n jaké zajímavé aktuální téma s vybraným školitel		
-	u odbornou literaturou a/nebo práce v laborato ích K N. Kapacita p edm tu je omezena možnostmi u itel seminá e. Probíra	· · · · · · · · · · · · · · · · · · ·	
nová.			
NIE-HSC	Side-Channel Analysis in Hardware	Z,ZK	4
This course is dedicated	d to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical atta	icks. Students get	familiar with
	annels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks a	_	n higher-order
	ractice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel inform		
NIE-DDW	Web Data Mining	Z,ZK	5
	t methods and technologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gair ling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an ove		_
•	iling, web structure analysis, web usage analysis, web content mining and information extraction. Students will also gain an ove and recommendation systems.	I VIEW OF THOSE TECE	an developments
NIE-BPS	Wireless Computer Networks	Z,ZK	4
	it the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in	· '	•
	and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get kno		
	nd get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools.		

NIE-SEP	World Economy and Business	Z,ZK	4
The course introduc	ces students of technical university to the international business. It does that predominantly by comparing individual countries and ke	y regions of world	economy.
Students get to kno	w about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, c	orruption and eco	nomic
development, which	n are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indivi	dual readings. It is	s advised to
take bachelor level	of this course BIE-SEP as a prerequisite.		
FITE-SEP	World Economy and Business	Z,ZK	4
The course introduc	ces students of technical universities to international business. It does that predominantly by comparing individual countries and key i	regions of the wor	ld economy.
Students get to kno	w about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, c	orruption and eco	nomic
development, which	n are needed for the right investment decision. Seminars help to improve knowledge in the form of discussions based on individual re	adings.	
	Company and the following abody:		
	Seznam p edm t tohoto pr chodu:		
Kód	Název p edm tu	Zakon ení	Kredity
	<u>-</u>		_
FIT-ACM1	Programovací praktika 1	KZ	5
	Tanta véh rové kura má ao aíl n inrovit tu nailanží atudantu na ranga-antaci fakultu v rámai masináradních ACM acut ží		
	Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.		
FIT-ACM2	Programovací praktika 2	KZ	5
			5
FIT-ACM2	Programovací praktika 2	KZ KZ	5
	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.		'
	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3		'
FIT-ACM3	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	KZ	5
FIT-ACM3	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4	KZ	5
FIT-ACM3	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	KZ KZ	5
FIT-ACM3	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5	KZ KZ	5
FIT-ACM3 FIT-ACM4 FIT-ACM5	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	KZ KZ KZ	5 5
FIT-ACM3 FIT-ACM4 FIT-ACM5	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží.	KZ KZ KZ	5 5
FIT-ACM3 FIT-ACM4 FIT-ACM5 FIT-ACM6 FITE-EHD	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6	KZ KZ KZ KZ Z,ZK	5 5 5
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduce	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History	KZ KZ KZ Z,ZK through the description	5 5 5 5 7 spription of the
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduction key historical perio	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy	KZ KZ KZ Z,ZK through the description the large econor	5 5 5 5 7 7 8 7 8 7 8 8 8 8 8 8 8 8 8 8
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduction the Roman Empirity	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro	KZ KZ KZ Z,ZK through the description the large econostitutions is decipled.	5 5 5 5 7 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduction the Roman Empirity	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro re to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial in	KZ KZ KZ Z,ZK through the description the large econostitutions is decipled.	5 5 5 5 7 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduction the Roman Empirity	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro re to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial in over the detailed economic history of particular events, inspections.	KZ KZ KZ Z,ZK through the description the large econostitutions is decipled.	5 5 5 5 7 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8
FIT-ACM3 FIT-ACM5 FIT-ACM6 FITE-EHD The course introduckey historical perio the Roman Empir course does not co	Programovací praktika 2 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 3 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 4 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 5 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Programovací praktika 6 Tento výb rový kurz má za cíl p ipravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM sout ží. Introduction to European Economic History ces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy ds. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. Fro re to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial in over the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, ins history. Class meetings will consist of a mixture of lectures and discussions.	KZ KZ KZ Z,ZK through the descript the large econostitutions is decipl stitutions and organizations.	5 5 5 7 5 7 7 8 7 8 7 8 8 8 8 8 8 8 8 8

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 knowledge in the form of discussions based on individual readings.

MI-SCE1 | Seminá po íta ového inženýrství I | Z | 4 | Seminá po íta ového inženýrství je výb rový p edm t pro studenty, kte í se cht jí zabývat hloub ji tématy íslicového návrhu, spolehlivosti a odolnosti proti poruchám a útok m. Ke student m se v rámci 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 tu 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 témata jsou pro každý semestr

MIE-MZI Mathematics for data science Z,ZK

In this course, the students are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used in data science. The studied topics include mainly: linear algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality principle, gradient methods) and selected notions from probability theory and statistics.

NI-AML Pokro ilé techniky strojového u ení Z,ZK 5

P edm t seznamuje studenty s vybranými pokro ilými tématy strojového u ení a um lé inteligence a jejich aplikace na reálné problémy. Témata p edstavují techniky v oblasti doporu ovacích systém, zpracování obrazu, ízení i propojení fyzikálních zákon s oblastí strojového u ení. Cílem cvi ení je podrobn seznámit studenty s probíranými metodami.

NI-DID Digital drawing Z 2

P edm t má za cíl p iblížit student m základní principy digitální kresby a grafické tvorby. Studenti získají pov domí o základech kompozice, perspektivy i teorie barev, což následn budou aplikovat ve svých samostatných pracích. Studenti také získají zkušenosti s kresbou v pr b hu praktických cvi ení. Kurz je vhodný pro kohokoli s chutí více kreslit a malovat, jelikož práv to je nedílnou sou ástí výuky. P edm t bude organizovaný formou tematických cvi ení pokrývajících ást teorie a tv r ích cvi ení, která jsou zam ena na procvi ování.

NI-DSW Design Sprint Z 2

Studenti budou pracovat 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 návrhu produktu nebo služby. B hem kurzu se seznámí s metodou Design Sprint z pohledu ú astníka. Na praktickém problému si vyzkouší celý 5ti denní proces od výzkumu po testování prototyp .

Díky za azení p ed za átek semestru mají studenti možnost vyzkoušet si metodu, která vyžaduje kontinuáln jší asovou alokaci než b žná výuka.

NI-GLR Games and reinforcement learning Z,ZK 4

The field of reinforcement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligence. This course is intended to give you both theoretical and practical background so you can participate in related research activities. Presented in English.

Grid Computing

Z,ZK

5

NI-GRI

Grid computing and gain knowledge about the world-wide network and computing infrastructure.

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 students should know machine learning basics. The emphasis is put on advanced algorithms (e.g., gradient boosting) and non-basic kinds of machine learning tasks (e.g., recommendation systems) and models (e.g., kernel methods).

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 an understanding of the challenges, questions and compromises associated with advanced software design. In the first part of the course, students will review and deepen their knowledge of object-oriented programming and learn the most commonly used design patterns, which represent the best practices for solving typical software design problems. In the second part of the course, students will be introduced to the principles of design and analysis of software architecture including classical architectural designs, component systems and some advanced software architectures 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.cvut.cz NIE-AIB Z,ZK Algorithms of Information Security 5 Studenti se seznámí s algoritmy bezpe ného generování klí a kryptografickým zpracováním chybových (nejen biometrických) dat. Dále se studenti seznámí s matematickými principy kryptografických protokol (identifika ních, autentiza ních a podpisových schémat). Získají znalosti o metodách detekce malware a použití strojového u ení v detek ních algoritmech. Taktéž se seznámí s metodami vytvá ení steganografických záznam , s metodami pro jejich vyhledávání a s útoky na n NIE-AM1 Middleware Architectures 1 Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information system architecture, web service architecture and aplication servers. The will also study principles and technologies for middleware focused on application integrations, asynchronous communications and high availability of applications. This course replaces the course MIE-MDW. NIF-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 architectures, concepts and technologies for microservices, distrubuted cache and databases, smart contracts, realtime communication and web security. 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 implementation units. Error Control Codes NIE-BKO 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 mathematical theory and principles of linear, cyclic codes and codes for the correction of multiple errors, clusters of errors and whole syllables (bytes). Students will also learn how to implement these detections and corrections for different types of transmissions (parallel, serial) when storing data in memory and when transmitting over telecommunication channels. NIE-BLO Blockchain 5 Z.ZK Students will understand the foundations of blockchain technology, smart contract programming, and gain an overview of most notable blockchain platforms. They will be able to design, code and deploy a secure decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course places an increased emphasis on the relationship between blockchains and information security. It is concluded with a defense of a research or applied semester project, which prepares the students for implementing or supervising implementation of blockchain-based solutions in both academia and business. **NIE-BPS** Wireless Computer Networks 7.7K 4 Students will learn about 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 knowledge of security mechanisms for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools NIE-BVS **Embedded Security** 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-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. Web Data Mining Students will learn latest methods and technologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gain an overview of Web mining techniques for Web crawling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an overview of most recent developments in the field of social web and recommendation systems. **NIE-DIP** Diploma Thesis 7 30 NIF-DSV Distributed Systems and Computing Z,ZK Students are introduced to methods for coordination of processes in distributed environment characterised by nondeterministic time responses of computing processes and communication channels. They learn basic algorithms that assure correctness of computations realized by a group of loosely coupled processes and mechanisms that support high availability of both data and services, and safety in case of failures. NIF-DVG Introduction to Discrete and Computational Geometry Z,ZK 5 The course intends to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with the most fundamental notions of this discipline, and to be able to solve simple algorithmic problems with a geometric component. 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 the base of advanced embedded systems, that profit from their specialized structure for effective computation and acceleration. Design of fast custom computing machines is discussed, including standardized means of internal communication, parallelism extraction and utilization in special structures and system architectures. NIE-EPC Z,ZK Effective C++ programming 5 Students learn how to use the modern features of contemporary versions of the C++ programming language for software development. The course focuses on programming effectivity and efficiency in the form of writing maintainable and portable source code and creating correct programs with low memory and processor time requirements Embedded Software 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. NIE-EVY Efficient Text Pattern Matching 7.7K 5 Students get knowledge of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient in both access time and memory complexity. They will be able to use the knowledge in design of applications that utilize pattern matching. 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 some software tools that allow to prove basic properties of software. NIF-GAK Graph theory and combinatorics 7.7K The goal of the class is to introduce the most important topics in graph theory, combinatorics, combinatorial structures, discrete models and algorithms. The emphasis will be not only on undestanding the basic principles but also on applications in problem solving and algorithm design. The topics include: generating functions, selected topics from graph and hypergraph

coloring, Ramsey to	heory, introduction to probabilistic method, properties of various special classes of graphs and combinatorial structures. The theory w of combinatorics on words, formal languages and bioinformatics.	vill be also applied	in the fields
NIE-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	•	l .
which is already a w	videspread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical com	putational structur	es, students
NIIT LIMI	will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.	Z,ZK	3
NIE-HMI The course focuse	History of Mathematics and Informatics as on selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer sci		_
	ome relations between computer science and mathematical methods. Some examples of applications of mathematics to computer sc	· · · · · · · · · · · · · · · · · · ·	
NIE-HSC	Side-Channel Analysis in Hardware	Z,ZK	4
	dicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attack	-	
	ide channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and hey 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 provide	es the knowledge needed for the analysis and design of computer systems security solutions. Students get an overview of safeguards	s against abuse of	the system
-	eans. They will be able to safely use and integrate hardware components into systems and test them for resistance to attacks. Studer	_	edge about
NIE-KOD	ptographic accelerators, PUF, random number generators, smart cards, biometric devices, and devices for internal security functions Data Compression	Z.ZK	5
-	duced to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of data	,	_
	ne overview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition, stude		
	lossy data compression methods used in image, audio, and video compression.		ı
NIE-KOP	Combinatorial Optimization	Z,ZK	6
The students will g	pain knowledge and understanding necessary deployment of combinatorial heuristics at a professional level. They will be able not only also to apply and evaluate heuristics for practical problems.	y to select and imp	Diement but
NIE-KRY	Advanced Cryptology	Z,ZK	5
	the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the		-
random number o	generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they ca their own systems or to the creation of their own software solutions.	an apply to the inte	egration of
NIE-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	d memory, which are today the most common computing nodes of powerful computer systems. Students will gain knowledge of archit	tecturally specific	optimization
techniques used to	reduce the decrease in computing power due to the widening performance gap between the computational requirements of multi-corrections.		ory interface
NIE-MKY	throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications. Mathematics for Cryptology	Z.ZK	5
	ilbší znalosti o algebraických postupech ešících nejd ležit jší matematické problémy, na kterých je založena bezpe nost šifer. Zejmé	,	_
soustavy polynomi			
30u3tavy polynomi	álních rovníc nad kone ným t lesem, problém faktorizace velkých ísel a problém diskrétního logaritmu. Problém faktorizace bude sp	peciáln ešen i na	a eliptických
	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce.		
NIE-MPI	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics	Z,ZK	7
NIE-MPI The course focuses	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce.	Z,ZK analysis, smooth o	7 optimization,
NIE-MPI The course focuses and multi-variate	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus	Z,ZK analysis, smooth o	7 optimization, s selected
NIE-MPI The course focuses and multi-variate numerical algorith	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation.	Z,ZK analysis, smooth on a last topic includer es on clear preser	7 optimization, s selected ntation and
NIE-MPI The course focuses and multi-variate numerical algorith	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus	Z,ZK analysis, smooth on a last topic included es on clear present	7 optimization, s selected ntation and 7
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end of	Z,ZK analysis, smooth of last topic includer es on clear preser Z sks that should be f the semester. 2.	7 poptimization, s selected ntation and 7 carried out The external
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s	Z,ZK analysis, smooth of last topic includer es on clear preser Z sks that should be fighter semester. 2." tudent/studijni/form	7 poptimization, s selected ntation and 7 carried out The external mulare). The
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sted form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic	Z,ZK analysis, smooth of last topic includer es on clear preser Z sks that should be of the semester. 2.1 tudent/studijni/form that the student h	7 poptimization, s selected natation and 7 carried out The external mulare). The las reserved
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s	Z,ZK analysis, smooth of last topic includer es on clear preser Z sks that should be of the semester. 2.1 tudent/studijni/form that the student h	7 poptimization, s selected natation and 7 carried out The external mulare). The las reserved
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus 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 tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sned form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies	Z,ZK analysis, smooth of last topic includes es on clear preser Z sks that should be of the semester. 2. Intudent/studijni/form that the student he FTT will be con	7 poptimization, s selected ntation and 7 carried out The external mulare). The lass reserved nplete and
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus 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 tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sned form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing the routine to the upon the semester of the semester of the semester of the semester of the semester.	Z,ZK analysis, smooth of last topic includes es on clear preser Z sks that should be of the semester. 2. Intudent/studijni/form that the student he FTT will be contact.	7 poptimization, s selected ntation and 7 carried out The external mulare). The lass reserved nplete and
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn a	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sned form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be of the semester. 2. Tudent/studijni/form that the student he FTT will be con Z,ZK and techniques and security.	7 poptimization, s selected natation and 7 carried out The external mulare). The lass reserved nplete and 5 d transfer
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn a	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus 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 tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sned form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing the routine to the upon the semester of the semester of the semester of the semester of the semester.	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be of the semester. 2. Intudent/studijni/form that the student has the FTT will be considered by the FTTT will be considered	7 poptimization, s selected nation and 7 carried out The external mulare). The lass reserved nplete and 5 d transfer
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at the NIE-MVI Students will under	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project go fi the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/steed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be of the semester. 2. The student/studijni/form of that the student has the FTT will be concerned. Z,ZK and techniques and security. Z,ZK el in nature and and security in the student has the student has security.	7 poptimization, s selected nation and 7 carried out The external mulare). The has reserved nplete and 5 d transfer 5 e applicable
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at the NIE-MVI Students will under to solving a wide rather solving a wide rather solving a wide rather solving a solving a wide rather solving a wide rathe	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s/sed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routi technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be of the semester. 2. The student/studijni/form of that the student has the FTT will be concept. Z,ZK and techniques and security. Z,ZK el in nature and and security in the student has the student has security.	7 poptimization, s selected nation and 7 carried out The external mulare). The has reserved nplete and 5 d transfer 5 e applicable use methods
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn a NIE-MVI Students will under to solving a wide ra	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sped form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic deform must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the provide at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routi technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. That the student is that the student in the FTT will be con Z,ZK and techniques and security. Z,ZK el in nature and ar is will learn how the c. Z,ZK	7 poptimization, s selected nation and 7 carried out The external mulare). The lass reserved nplete and 5 d transfer 5 e applicable ese methods
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn a NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intit	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s/sed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routi technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be of the semester. 2. The student/studijni/form of that the student has the FTT will be consecurity. Z,ZK and techniques and security. Z,ZK el in nature and and security. Z,ZK s will learn how the c. Z,ZK s to real-world pro	7 poptimization, s selected nation and 7 carried out The external mulare). The lass reserved nplete and 5 d transfer 5 e applicable ese methods 5 blems. They
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn a NIE-MVI Students will under to solving a wide ra NIE-NON Students will be into will also learn the formula in the solving a wide ra	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sted form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routi technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and Numerical Methods Nonlinear Continuous Optimization and Numerical Methods roduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such method in	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. That the student is that the student in the FTT will be consecurity. Z,ZK and techniques and security. Z,ZK et in nature and ar is will learn how the c. Z,ZK s to real-world promotively learn to solve	7 poptimization, s selected nation and 7 carried out The external mulare). The has reserved applete and 5 d transfer 5 e applicable ese methods 5 blems. They systems of
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide rat NIE-NON Students will be intuited in the filinear algebraic editor.	k ivkåch. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end or information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s. led form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester. Modern Internet Technologies advanced networks: They g	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form that the student he FTT will be con Z,ZK and techniques and security. Z,ZK el in nature and ar is will learn how the c. Z,ZK s to real-world promotion will learn to solve these algorithms is	7 poptimization, s selected nation and 7 carried out The external mulare). The has reserved applete and 5 d transfer 5 e applicable as methods 5 blems. They systems of sequentially
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intrivial also learn the filinear algebraic expenses.	k ivkách. Studenti se rovnež seznámí s moderními šífrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end of the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s. bed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies Advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et Nonlinear Continuous Opt	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form that the student he FTT will be considered by Z,ZK and techniques and security. Z,ZK el in nature and are significantly will learn how the c. Z,ZK s to real-world provide algorithms significant to solve these algorithms significant to solve the solve	7 potimization, s selected ntation and 7 carried out The external mulare). The last reserved inplete and 5 d transfer 5 e applicable ese methods 5 blems. They systems of sequentially 5
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intrivial also learn the filinear algebraic economics.	k ivkåch. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The mand their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end or information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s. led form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the immediate tasks the supervisor assigns to the student for the upcoming semester. Modern Internet Technologies advanced networks: They g	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form the FTT will be considered by the ETT will be consid	7 poptimization, s selected ntation and 7 carried out The external mulare). The last reserved nplete and 5 d transfer 5 e applicable less methods 5 blems. They systems of sequentially 5 from system
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intrivial also learn the filinear algebraic economics.	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tax. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s and form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that to approvable at the end of the semester. Modern Internet Technologies 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 Computational Intelligence Methods stand the basic methods and techniques of computational litelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et al. Nonlinear Continuous Optim	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form the FTT will be considered by the ETT will be consid	7 poptimization, s selected ntation and 7 carried out The external mulare). The last reserved inplete and 5 d transfer 5 e applicable ese methods 5 blems. They systems of sequentially 5 from system ren software ride the core
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intrivial also learn the filinear algebraic economics.	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s/seled form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocolos 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 Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students with work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et a Nonlinear Continuous	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form the FTT will be considered by the ETT will be consid	7 poptimization, s selected ntation and 7 carried out The external mulare). The last reserved inplete and 5 d transfer 5 e applicable ese methods 5 blems. They systems of sequentially 5 from system ren software ride the core
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide ra NIE-NON Students will be intrivial also learn the filinear algebraic economics.	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po ítání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end on the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sted form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routi technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence games and optimisation, et a subject is also devoted to	Z,ZK analysis, smooth of a last topic includer es on clear preser Z sks that should be if the semester. 2. The student/studijni/form the FTT will be considered by the ETT will be consid	7 poptimization, s selected ntation and 7 carried out The external mulare). The last reserved inplete and 5 d transfer 5 e applicable ese methods 5 blems. They systems of sequentially 5 from system ren software ride the core
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide rat NIE-NON Students will be intuited in the solving a wide rat NIE-NON Students will be intuited in the solving and entropy architecture. In the functionality of infor NIE-NUR Students will understudents	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po itání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end or information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sted form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies 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 Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et al. Nonlinear Continuous Optim	Z,ZK analysis, smooth of elast topic includer es on clear preserving the serving and entropy-related Z,ZK analysis, smooth of elast topic includer es on clear preserving and several several elast topic and entropy-related Z,ZK and the student has security. Z,ZK and the student has escurity. Z,ZK and the student has	7 optimization, s selected natation and 7 carried out The external mulare). The las reserved nplete and 5 d transfer 5 de applicable ese methods 5 blems. They systems of sequentially 5 from system ven software ride the core and principles. 5 fundamental
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide rat NIE-NON Students will be intuited in the solving a wide rat NIE-NON Students will be intuited in the solving and entropy architecture. In the functionality of infor NIE-NUR Students will understudents	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po itání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end one information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/s led form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the approvable at the end of the semester. Modern Internet Technologies advanced networking technologies and protocols for both local area networks and wide area networks. They get acquainted with routing technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et of problems. The subject is	Z,ZK analysis, smooth of elast topic includer es on clear preserving the serving and entropy-related Z,ZK analysis, smooth of elast topic includer es on clear preserving and several several elast topic and entropy-related Z,ZK and the student has security. Z,ZK and the student has escurity. Z,ZK and the student has	7 optimization, s selected natation and 7 carried out The external mulare). The las reserved nplete and 5 d transfer 5 de applicable ese methods 5 blems. They systems of sequentially 5 from system ven software ride the core and principles. 5 fundamental
NIE-MPI The course focuses and multi-variate numerical algorith NIE-MPR 1. At the beginning during the semeste supervisor enters the completed and sign is rather general, NIE-MTI Students learn at NIE-MVI Students will under to solving a wide rat NIE-NON Students will be intuited in the solving a wide rat NIE-NON Students will be intuited in the solving and entropy architecture. In the functionality of infor NIE-NUR Students will understudents	k ivkách. Studenti se rovnež seznámí s moderními šifrovacími systémy založenými na po itání na m ížce. Mathematics for Informatics on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The m and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focus argumentation. Master Project of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tar. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end or information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/sted form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that it approvable at the end of the semester. Modern Internet Technologies 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 Computational Intelligence Methods stand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallinge of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, et al. Nonlinear Continuous Optim	Z,ZK analysis, smooth of elast topic includer es on clear preserving the serving and entropy-related Z,ZK analysis, smooth of elast topic includer es on clear preserving and several several elast topic and entropy-related Z,ZK and the student has security. Z,ZK and the student has escurity. Z,ZK and the student has	7 optimization, s selected natation and 7 carried out The external mulare). The las reserved nplete and 5 d transfer 5 de applicable ese methods 5 blems. They systems of sequentially 5 from system ven software ride the core and principles. 5 fundamental

NIE-OSY Operating Systems and Systems Programming Z,ZK 5 This course is focused on the design and implementation of the basic components that make up modern operating systems. This includes threads, processes, switching context, virtual memory, system calls, interrupts and interactions of SW and HW using drivers. Students will learn the theory of the concept of operating system architecture with emphasis on the kernel architecture. Within the course, they will gain practical experience with the development of a small but fully functional operating system. NIE-PAM Parameterized Algorithms There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necessary to solve these problems exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one can find a common property (parameter) of the inputs from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponentially in this (small) parameter and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial time preprocessing of the input, which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution method. We will present a plethora of parameterized algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorithm (presumably) does not exist. We will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes. Advanced Database Systems NIF-PDB 5 Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of database 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. 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 framework. 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 as computer vision and natural language processing. Parallel and Distributed Programming 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 acquianted 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-PIS Advanced Information Systems Students learn the notion of business process logic and its formalization, with business process roles, business rules, and data processing, with the notion of service oriented 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 agility and adaptivity and using of artificial intelligence methods for implementation of these ideas in ISs. They understand modern object-oriented methodologies for modelling of business processes, business rules, 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 characteristics and behaviors of individual entities. While PML is commonly used in applications such as recommender systems, which recommend items to users based on their personal interests, its principles can be applied to a wide range of other fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from theoretical, algorithmic, and practical perspectives. Specifically, we will focus on cutting-edge models that are of interest to both the research and commercial communities. NIF-RFV Reverse Engineering Students will learn fundamentals of reverse engineering of computer software (methods of executing and initializing programs, organization of executable files, work with third-party libraries). Special attention will be paid to C ++. Students will also become familiar with the principles of debugging tools, disassemblers and obfuscation methods. Finally, the course will focus on code compression and decompression and executable file reconstruction. NIE-ROZ Z.ZK Pattern Recognition 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 statistical approach to pattern recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, and their numerical aspects System Security and Forensics Students will be introduced to various aspects of system security (principles of endpoint security, principles of security policies, security models, authentication concepts). Students will also learn about forensic analysis as a tool for investigating security incidents (techniques used by malicious software or attackers, forensic analysis techniques, and the importance of memory or file system artifacts for attack analysis and detection). Computer Engineering Seminar Master I The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. NIE-SCE2 Computer Engineering Seminar Master II Ζ The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. NIE-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 and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite. **Network Security** The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically about detection and defense. The course explains basic pricipals of security monitoring, packet-based and flow-based analysis, in order to detect anomalies and suspicious network traffic. The course focuses on explanation and practical examples of various mechanisms of securing network infrastructure and detection in real time. The course covers general principals of handling detected security events (i.e. incident handling and incident response). NIE-SIM Digital Circuit Simulation and Verification Z.ZK Aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers today recent verification methods, too.

NIE-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 teci	nnologies, method	ds and best
practices for mod	elling, integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge	graphs and their	systematic
	quality assurance.		
NIE-SYP	Parsing and Compilers	Z,ZK	5
The module builds (pon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of va	rious variants and	applications
	of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.		_
NIE-TES	Systems Theory	Z,ZK	5
Today, humankin	d has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). Howevei	, the costs of mar	naging this
complexity and of e	ensuring the correct behavior of a given system have become critical. A key technique for mastering this complexity is the usage of m	odels that describ	e only those
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	orithms that form	the basis for
	the modeling and analysis of complex systems.		
NIE-TSP	Testing and Reliability	Z,ZK	5
Students will gain I	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to prej	oare a test set wit	h 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	lt-in-self-test equi	ipment. 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
_	n knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	_	
	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		•
management of cor	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in	the use of moder	rn 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 probab	ility theory; Multivariate normal distribution; Entropy and its application to coding; Statistical tests: T-tests, goodness of fit tests, independent	dence test; Rando	m processes
	- stacionarity; Markov chains and limiting properties; Queuing theory		
NIE-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.		•

Aktualizace výše uvedených informací naleznete na adrese http://bilakniha.cvut.cz/cs/FF.html Generováno: dne 20.11.2025 v 19:33 hod.