Study plan

Name of study plan: Teaching Informatics for Secondary Schools

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Učitelství informatiky pro střední školy
Type of study: Follow-up master full-time
Required credits: 102
Elective courses credits: 18
Sum of credits in the plan: 120
Note on the plan: Aby student splnil alespoň předepsaných 120 kreditů celkem, musí si vedle povinných a povinně volitelných předmětů, předepsaných tímto plánem zapisovat a splnit kterékoliv fakultní magisterské odborné předměty.

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

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

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

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

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

Code of the group: UNI-PP-OBD
Name of the group: Sector didactics - compulsory courses of the program Teaching Computer Science for secondary school
Requirement credits in the group: In this group you have to gain 32 credits
Requirement courses in the group: In this group you have to complete 6 courses
Credits in the group: 32
Note on the group:

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

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

UNI-DI1	Didactics of Informatics I	Z,ZK	6

The course builds on the subjects General Pedagogy and General Didactics and applies the acquired knowledge to didactics in the field of informatics and related technologies. The student will get acquainted with the ways of theoretical teaching of information technologies and in connection with their practical practice and verification of knowledge.

UNI-DI2	Didactics of Informatics II	KZ	7

The course builds on the subject Didactics of Informatics I and applies the knowledge to the practical use of evaluation tools for various types of tests Moodle (theory), Marast (examples, mathematics, informatics), Progtest (programs in C/C++), LearnShell (bash scripts). Students learn to work with the tools, prepare/program examples and test them on each other. Students get acquainted and help with preparing real tests from selected topics, get acquainted and help with the preparation of programming competitions for secondary school. The course is significantly built on independent work and processing of semester project (this corresponds to the credit load).

UNI-IB	Information security	Z,ZK	5

The course covers the area of description of basic cryptographic schemes and also introduces students to the basics of network and system security. Great attention is paid to current topics of cyber security, such as ethical hacking, penetration testing and malware. At the end of the course students are introduced to the issues of secure programming, security of web applications. Student learns how to avoid traps that can be set for users and thus basics of safe behavior of users and risk minimization.

UNI-MTUI	Modern technology and artificial intelligence	Z,ZK	5

Students will get acquainted with selected tools that can be used for data acquisition and processing and subsequently for their analysis and visualization. Using real data and problems, the basics of machine learning and artificial intelligence will be explained. In the next part of the course, the acquired knowledge will be used to work with tools for working with image data. In the last part of the course, students will get acquainted with the basics of robotics, especially agent systems and motion planning.

UNI-SPD	Semester project for thesis	Z	3

The aim of the course is to deepen standards and requirements for theses. It takes place mainly in the form of individual consultations with supervisors of theses and independent work. At the beginning of the course there is a block meeting with students, which introduces the student to the requirements for theses and the interconnection of professional and didactic issues. Total burden in the range of 3 ECTS. The student prepares a research of resources according to the supervisor's request, chooses a method of work, or prepares a separate chapter.

UNI-TP	Computer technology	Z,ZK	6

The course practically focuses on embedded systems and low-level software. It explains that the basis is the design of algorithms and their implementation, whether in hardware or in software, with regard to limiting conditions (size, speed, reliability). Topics are discussed in an overview form and practiced on specific examples in the laboratory. Laboratory exercises are aimed at getting students acquainted with teaching methods, e.g. how to show that there is not only reconfigurable software (a program in rewritable memory) but also hardware (FPGA). It demonstrates how to adapt tasks to the teaching of secondary school students and their expected knowledge, e.g. by means of interactive tutorials.

Code of the group: UNI-PP-PR

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

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

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

Credits in the group: 24

Note on the group:

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

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

UNI-PPP	Propedeutics of pedagogical practice	KZ	6

The course is focused on the preparation of students for lessons before teaching practice.

UNI-RPP	Reflection of teaching practice	Z	3

In the practically focused subject, special attention will be paid to the joint search for suitable solutions to the most common difficulties of pedagogical practice, as well as to effective ways of coping with dynamic changes in contemporary education. Teaching mainly builds on the targeted building of a safe space to reflect one's own dispositions for learning, to share and process emotions as well as challenging topics from practice, including presentation and communication of students' first pedagogical outputs. Procedures included: structured discussion, feedback interviews and mentoring.

UNI-SPP	Continuous teaching practice	KZ	15

Before entering the practice, the student undergoes the propedeutic of the teaching practice. The first part of the direct practice includes, in particular, hospitalization at a particular school and the processing of hospitalization protocols. In the next part, students also directly enter the lessons and engage in activities related to the running of the school. At least 192 hours participate in the direct teaching activity, of which 96 hours directly teach either alone or in a couple. Home preparation for teaching, protocol processing, etc., i.e. a total of 450 hours is included in the 15 credits.

Code of the group: UNI-PP-PO
Name of the group: compulsory Sectorials of the program Teaching Informatics for secondary schools
Requirement credits in the group: In this group you have to gain 19 credits
Requirement courses in the group: In this group you have to complete 3 courses
Credits in the group: 19
Note on the group:

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

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

UNI-ADS	Algorithms and data structures	Z,ZK	7

The course covers the most basic of the efficient algorithms, data structures and graph theory that every computer scientist should know. As part of the exercise, students are introduced to the use of explained algorithms for solving practical problems. Furthermore, students gain basic knowledge of the design and use of finite automata, regular expressions, the use of context-free grammars and the design and use of stack automata. They are introduced to the Turing machine and to the complexity classes P and NP.

UNI-PS	Computers and networks	Z,ZK	6

Students are generally explained the principles of the internal organization and architecture of computer systems. Using simple examples, they will understand how a standard multi-core, vector- and GPU-accelerated computer connected to the Internet processes, stores and sends data in a multi-user operating system. The work at the command-line level penetrates the entire subject and will be explained continuously.

UNI-VSA	Development of SW applications	Z,ZK	6

The lectures consist of topics devoted to methodology, SW systems architectures, technology platforms as well as support tools used in practice shared code repositories, CI/CD (Continuous Integration / Continuous Delivery) tools, application repositories (Google Play, App Store, Github, Gitlab,). The space will also be devoted to the use of SW components and services provided to developers, often free of charge (cloud storage, bug logging, authentication/authorization using Google or Facebook accounts and others). The seminars/exercises are designed so that students can try out at least one of many possible ways of developing and deploying a simple SW application.

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

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

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

UNI-DIP	Diploma Thesis	Z	9

The eaching is based on individual consultations with the supervisor of the thesis or another consultant (didactic part). The scope of the 9 ECTS lessons (i.e. about 270 hours) includes consultations, preparation of the theoretical part, practical part, writing and defence of the thesis before the commission.

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 12
The role of the block: PV

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

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

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

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

NIE-KRY	Advanced Cryptology	Z,ZK	5

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

NIE-PDB	Advanced Database Systems	Z,ZK	5
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	5
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-AIB	Algorithms of Information Security	Z,ZK	5
Students will get acquainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, students will learn the mathematical principles of cryptographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware detection and the use of machine learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic systems.			
NIE-ADP	Architecture and Design patterns	Z,ZK	5
The objective of this course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysis as well as with understanding of the challenges, issues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowledge of object-oriented programming and get familiar with the commonly used object-oriented design patterns that represent the best practices for solving common software design problems. In the second part the students will be introduced to the principles of software architecture design and analysis. This includes the classical architectural styles, component based systems, and some advanced software architectures used in large-scale distributed systems.			
NIE-SIM	Digital Circuit Simulation and Verification	Z,ZK	5
Aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers today recent verification methods, too.			
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 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.			
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-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-BVS	Embedded Security	Z,ZK	5
Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of cryptographic primitives in hardware and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources for securing internal functions of computer systems.			
NIE-ESW	Embedded Software	Z,ZK	5
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the basic techniques of programming in C language and code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing, up to sophisticated techniques combined with artificial intelligence.			
NIE-BKO	Error Control Codes	Z,ZK	5
The course expands the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary 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-FME	Formal Methods and Specifications	Z,ZK	5
Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some software tools that allow to prove basic properties of software.			
NIE-GPU	GPU Architectures and Programming	Z,ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the CUDA 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-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	Z,ZK	5
Students will gain deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In particular, the course focuses on the problem of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discrete logarithm. The problem of factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.			
NIE-AM1	Middleware Architectures 1	Z,ZK	5
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.			
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 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.			

NIE-SIB	Network Security	Z,ZK	5
The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically 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-NSS	Normalized Software Systems	ZK	5
Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from 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-REV	Reverse Engineering	Z,ZK	5
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	5
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	5
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.			
NIE-NUR	User Interface Design	Z,ZK	5
Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs.			
NIE-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and organizations. They will get acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiently operate and optimize the performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effective technology today for the management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in the use of modern integration and development tools (Continuous integration and development).			

Code of the group: UNI-PV-UCIPKA2
Name of the group: Teacher propedeutics 2 - Compulsory elective courses
Requirement credits in the group: In this group you have to gain at least 6 credits (at most 18)
Requirement courses in the group: In this group you have to complete at least 2 courses (at most 6)
Credits in the group: 6
Note on the group:

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

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

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

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

Code of the group: UNI-V
Name of the group: Elective courses of the Teaching Informatics for Secondary Schools program
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group:

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

NI-BUI	**Business Informatics** *Petra Pavlíčková* ***Petra Pavlíčková*** *Petra Pavlíčková (Gar.)*	Z,ZK	5	2P+2C	L	v
NI-PIS	**Enterprise Information Systems** *Martin Závrbský, Martin Mach, Vlastimil Jinoch, Martin Hasaj* ***David Buchtela*** *David Buchtela (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-KRY	**Advanced Cryptology** *Róbert Lórencz, Jiří Buček* ***Jiří Buček*** *Róbert Lórencz (Gar.)*	Z,ZK	5	2P+2C	Z	v
NI-PAS	**Advanced Aspects of Business** *David Buchtela, Štěpánka Havlíková, Dominik Vítek, Jiří Maršál, Jana Soukupová, Zdeněk Kučera* ***David Buchtela*** *Zdeněk Kučera (Gar.)*	Z,ZK	4	2P+1C	Z	v
NI-PDB	**Advanced Database Systems** *Michal Valenta, Yelena Trofimova* ***Michal Valenta*** *Michal Valenta (Gar.)*	Z,ZK	5	2P+1C	Z	v
FIT-ACM1	**Programming Practices 1** ***Tomáš Valla***	KZ	5	4C	L	v
FIT-ACM2	**Programming Practices 2** ***Ondřej Suchý***	KZ	5	4C	Z	v
FIT-ACM3	**Programming Practices 3** ***Ondřej Suchý***	KZ	5	4C	L	v
FIT-ACM4	**Programming Practices 4** ***Ondřej Suchý***	KZ	5	4C	Z	v
BI-ACM4	**Programming Practices 4** *Tomáš Valla, Ondřej Suchý* ***Tomáš Valla*** *Ondřej Suchý (Gar.)*	KZ	5	4C	Z	v
FIT-ACM5	**Programming Practices 5** ***Ondřej Suchý***	KZ	5	4C	L	v
FIT-ACM6	**Programming Practices 6** ***Ondřej Suchý***	KZ	5	4C	L	v
NI-GPU	**GPU Architectures and Programming** *Ivan Šimeček* ***Ivan Šimeček*** *Ivan Šimeček (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-PDD	**Data Preprocessing** *Marcel Jiřina* ***Marcel Jiřina*** *Marcel Jiřina (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-REV	**Reverse Engineering** *Josef Kokeš* ***Josef Kokeš*** *Josef Kokeš (Gar.)*	Z,ZK	5	1P+2C	Z	v
NI-RUN	**Runtime Systems** *Filip Křikava* ***Filip Křikava*** *Filip Křikava (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-SWE	**Semantic Web and Knowledge Graphs** *Milan Dojčinovski, Jakub Klímek* ***Milan Dojčinovski*** *Milan Dojčinovski (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-SIM	**Digital Circuit Simulation and Verification** *Martin Kohlík* ***Martin Kohlík*** *Martin Kohlík (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-SIB	**Network Security** *Simona Fornůsek, Jiří Dostál, Martin Šutovský, Martin Holec* ***Simona Fornůsek*** *Jiří Dostál (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-SCR	**Statistical Analysis of Time Series** *Kamil Dedecius* ***Kamil Dedecius*** *Kamil Dedecius (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-SLA	**Sublinear algorithms** *Dušan Knop* ***Dušan Knop*** *Dušan Knop (Gar.)*	Z,ZK	5	2P+1C	Z	v
FIT-SEP	**World Economy and Business**	Z,ZK	4	2P+2C	L	v
NI-SYP	**Parsing and Compilers** *Jan Janoušek* ***Jan Janoušek*** *Jan Janoušek (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-SBF	**System Security and Forensics** *Simona Fornůsek, Marián Svetlík* ***Simona Fornůsek*** *Róbert Lórencz (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-DSS	**Decision Support Systems** *Petra Pavlíčková, Robert Pergl, David Buchtela* ***David Buchtela*** *Robert Pergl (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-TES	**Systems Theory** *Stefan Ratschan, Jiří Vyskočil* ***Stefan Ratschan*** *Stefan Ratschan (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-TSP	**Testing and Reliability** *Petr Fišer* ***Martin Daňhel*** *Petr Fišer (Gar.)*	Z,ZK	5	2P+2C	Z	v
NI-TSW	**Software Product Development** *Petra Pavlíčková* ***Petra Pavlíčková*** *Petra Pavlíčková (Gar.)*	KZ	4	1P+2C	Z	v
NI-UMI	**Artificial intelligence** *Pavel Surynek* ***Pavel Surynek*** *Pavel Surynek (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-EHW	**Embedded Hardware** *Jan Schmidt* ***Jan Schmidt*** *Jan Schmidt (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-ESW	**Embedded Software** *Miroslav Skrbek, Hana Kubátová* ***Miroslav Skrbek*** *Hana Kubátová (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-VCC	**Virtualization and Cloud Computing** *Jan Fesl, Tomáš Vondra* ***Tomáš Vondra*** *Tomáš Vondra (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-APR	**Selected Methods for Program Analysis** *Filip Křikava* ***Filip Křikava*** *Filip Křikava (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-PON	**Selected Topics in Optimization and Numerical mathematics** *Daniel Vašata, Štěpán Starosta, Karel Klouda* ***Daniel Vašata*** *Štěpán Starosta (Gar.)*	Z,ZK	5	2P+1C	L	v
NI-VMM	**Retrieval from Multimedia** *Tomáš Skopal, Jiří Novák* ***Jaroslav Kuchař*** *Tomáš Skopal (Gar.)*	Z,ZK	5	2P+1C	Z	v
NI-MCC	**Multicore CPU Computing** *Daniel Langr, Ivan Šimeček* ***Ivan Šimeček*** *Ivan Šimeček (Gar.)*	Z,ZK	5	2P+1C	Z	v

FITE-SEP	**World Economy and Business**	Z,ZK	4	2P+2C	Z	V

Characteristics of the courses of this group of Study Plan: Code=UNI-V Name=Elective courses of the Teaching Informatics for Secondary Schools program

NI-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).			
NI-AIB	Algorithms of Information Security	Z,ZK	5
Students will get acquainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, students will learn the mathematical principles of cryptographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware detection and the use of machine learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic systems.			
NI-ADP	Architecture and Design patterns	Z,ZK	5
The objective of this course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysis as well as with understanding of the challenges, issues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowledge of object-oriented programming and get familiar with the commonly used object-oriented design patterns that represent the best practices for solving common software design problems. In the second part the students will be introduced to the principles of software architecture design and analysis. This includes the classical architectural styles, component based systems, and some advanced software architectures used in large-scale distributed systems.			
NI-AM1	Middleware Architectures 1	Z,ZK	5
Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information 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.			
NI-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.			
NI-BML	Bayesian Methods for Machine Learning	KZ	5
The subject is focused on practical use of basic Bayesian modeling methods in the dynamically evolving machine learning theory. In particular, it studies the construction of appropriate models providing description of real phenomena, as well as their subsequent use, e.g., for forecasting of future evolution or learning about the hidden variables (true object position from noisy observations etc.). The emphasis is put on understanding of explained principles and methods and their practical adoption. For this purpose, a number of real world examples and applications will be presented to students, for instance, 2D/3D object tracking, radiation source term estimation, or separation in medical imaging. The students will try to solve some of them.			
NI-BVS	Embedded Security	Z,ZK	5
Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of cryptographic primitives in hardware and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources for securing internal functions of computer systems.			
NI-BKO	Error Control Codes	Z,ZK	5
The goal of the course is to present various ways to detect or correct individual errors and burst errors in data stored into memories or transmitted via channels.			
NI-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 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.			
NI-DDW	Web Data Mining	Z,ZK	5
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.			
NI-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.			
NI-EVY	Efficient Text Pattern Matching	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.			
NI-FME	Formal Methods and Specifications	Z,ZK	5
Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some software tools that allow to prove basic properties of software.			
NI-GEN	Code Generators	Z,ZK	5
Advanced techniques of translating programs written in high-level programming languages are essential for understanding the field of systems programming. This primarily involves understanding the algorithms and techniques used to translate more complex programming constructs of modern languages employed in systems programming. Students will become familiar with both the theoretical and practical aspects of implementing the back-end of optimizing compilers for programming languages.			
NI-GAK	Graph theory and combinatorics	Z,ZK	5
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.			
FITE-GRI	Grid Computing	Z,ZK	5
Grid computing and gain knowledge about the world-wide network and computing infrastructure.			
NI-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.			

FITE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.			
NI-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.			
NI-MKY	Mathematics for Cryptology	Z,ZK	5
Students will gain deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In particular, the course focuses on the problem of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discrete logarithm. The problem of factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.			
NI-MVI	Computational Intelligence Methods	Z,ZK	5
Students will understand methods and techniques of computational intelligence that are mostly nature-inspired, parallel by nature, and applicable to many problems. They will learn how these methods work and how to apply them to problems related to data mining, control, intelligen games, optimizations, etc.			
NI-MEP	Modelling of Enterprise Processes	Z,ZK	5
The subject is focused on introduction to the discipline of Enterprise Engineering. Students learn the importance of a proper methodological approach for (re)engineering and implementation of processes, organisation structures and information support in big enterprises and institutions.			
NI-MPJ	Modelling of Programming Languages	Z,ZK	5
The analysis, transformation, and code generation processes depend on the semantics of the language; in particular, they are correct if they preserve the semantics of the language. This course explores the semantics of programming languages. The students will learn the language models with emphasis on functional languages, students are expected to understand the basics of the lambda calculus and here get acquainted with the advanced lambda calculus. The students also get hands-on-experience with semantic modeling and execution tools.			
FIT-ITI	Modern IT infrastructure	Z,ZK	5
with a very limited and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A modern data or computing center is understood here as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies. The proposed solution should thus be capable of continuous and economically optimal operation.			
NI-MTI	Modern Internet Technologies	Z,ZK	5
SYNOPSIS The subject "Modern Internet Technologies" is designed on four major pillars of networking: 1. Unified Communication and Collaboration - A single network, oriented on TCP/IP is able to carry whatever types of protocols for whatever purposes. This architecture is able to be protocol independent and carries voice, video and data to achieve seamless integrated services. 2. Design of Extremely Scalable Networks - This provides the insights of network architectures which can accommodate hundreds of millions of users and billions of devices. Thus, there is a paradigm switch from LANs (Local Area Networks) to SPs (Service Providers). 3. Traffic Segregation, Traffic Matching and Traffic Prioritisation - These technologies allow service providers to create private channels of communication between customers, with guaranteed parameters (bandwidth, delay, jitter, type of protocol). 4. Acceleration Technologies - They allow traffic to be carried at the optimal speed and allow for graceful degradation of service parameters in case of failures.			
NI-NUR	User Interface Design	Z,ZK	5
Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs.			
NI-NON	Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5
Students will be introduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such 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.			
NI-NSS	Normalized Software Systems	ZK	5
Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from 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.			
NI-OSY	Operating Systems and Systems Programming	Z,ZK	5
The course covers system programming in UNIX environment. Emphasis is given on kernel development with focus on kernel architecture and kernel data structures. Key topics are: process management, memory management, file operations and architecture of modern file systems, device drivers and network programming.The course also addresses kernel development process, upgrades of existing kernels, kernel booting, debugging using dynamic instrumentation, and techniques to guarantee portability. Specifics of kernel architecture in embedded and real-time operating systems are also discussed. Theoretical and general principles are demonstrated on the LINUX kernel. Within labs, students will work on projects focused on development of LINUX kernel modules.			
NI-BUI	Business Informatics	Z,ZK	5
The aim of the course is to focus on operational, tactical and strategic management of business informatics. Students will gain knowledge in the areas of business process management, ICT services and architectures in enterprise informatics. They will also learn about the principles, models and standards (ITIL, COBIT) in IT management, and lifecycle management of ICT services and resource management (sourcing). Students will learn the process of creating and implementing information strategy, IT Governance, the importance of ICT for business and the context of information strategy with global business strategy. They will also gain knowledge in the areas of economic IT management, revenue and investment management, IT investment evaluation and human resources management in IT (roles CIO, CEO, CFO).			
NI-PIS	Enterprise Information Systems	Z,ZK	5
The course is focused on the current IT requirements of large companies in the Czech Republic (Top 100). The basis is Data management, storage of big data (BigData) and their use in BI (Business Intelligence). The principles of solving the overall architecture of information systems in the banking, insurance and telecommunications sectors will be explained on real examples. Furthermore, students will get acquainted with the life cycle of information systems in the company / organization and its impact on the business strategy of the company. Students will be acquainted with technologies that have proven themselves in the elimination of basic risks in the planning, implementation and operation of information systems in the company / organization.			
NI-KRY	Advanced Cryptology	Z,ZK	5
Students will learn the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the mathematical principles of random number generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they can apply to the integration of their own systems or to the creation of their own software solutions.			
NI-PAS	Advanced Aspects of Business	Z,ZK	4
The aim of the course is to provide students with advanced (compared to the bachelor's degree) knowledge and skills needed to establish and run their own business or business management, especially in law, administration (necessary steps and documents), business economics, foreign trade and related aspects.			

NI-PDB	Advanced Database Systems	Z,ZK	5
Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of 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.			
FIT-ACM1	Programming Practices 1	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
FIT-ACM2	Programming Practices 2	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
FIT-ACM3	Programming Practices 3	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
FIT-ACM4	Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
BI-ACM4	Programming Practices 4	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
FIT-ACM5	Programming Practices 5	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
FIT-ACM6	Programming Practices 6	KZ	5
This is a selective course for preparing talented student for representation in international programming contests.			
NI-GPU	GPU Architectures and Programming	Z,ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the 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.			
NI-PDD	Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data sources, such as images, texts, time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteristics from images or from web pages.			
NI-REV	Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before and after the main function is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated to reverse engineering of applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be dedicated to debuggers: how debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer malware scene. The focus of the course is on the seminars, where students will solve practically oriented tasks from the real world.			
NI-RUN	Runtime Systems	Z,ZK	5
This course is an introduction to the world of virtual machines (VM) for high-level programming languages. There are two goals: Give you hands-on experience in design and implementation of a compiler and a VM from scratch, including Abstract Syntax Tree (AST) interpretation Byte code (BC) design and interpretation AST to BC compilation Memory management Just-in-time compilation and some optimization techniques Through a series of guest lectures, introduce you to various advanced topics and implementations of real-world VMs, including Dynamic optimizations, speculations, and deoptimizations Language implementation frameworks Read-world VMs			
NI-SWE	Semantic Web and Knowledge Graphs	Z,ZK	5
The students will learn the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web technologies, methods and best practices for modelling, integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge graphs and their systematic quality assurance.			
NI-SIM	Digital Circuit Simulation and Verification	Z,ZK	5
The aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers recent verification methods, too.			
NI-SIB	Network Security	Z,ZK	5
NI-SCR	Statistical Analysis of Time Series	Z,ZK	5
The course deals with the practical use of the basic time series modelling theory in engineering tasks, ranging from economics (stock exchange prices, employment) and industrial problems (modelling of signals and processes) to computer networks (network components load, attacks detection). The students learn to select a convenient process model, estimate its parameters, analyze its properties and use it for forecasting of future or intermediate values. The stress is put on understanding and adoption of the main principles based on practical real-world examples. Both the lab classes and the lectures exploit freely available software packages in order to provide easy and straightforward transfer of students' knowledge from the academic to the real world.			
NI-SLA	Sublinear algorithms	Z,ZK	5
We will introduce three methods to tackle algorithms working in sublinear space.			
FIT-SEP	World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by 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.			
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.			
NI-SBF	System Security and Forensics	Z,ZK	5
Students will get familiar with aspects of system security (principles of end station security, principles of security policies, security models, authentication concepts). Furthermore, students will get familiar with forensic analysis as a tool for investigating security incidents (techniques used by malicious software/attackers and forensic analysis techniques and the importance of operating system/operating system artifacts or file system for attack analysis and detection).			
NI-DSS	Decision Support Systems	Z,ZK	5
The aim of the course is to provide students with knowledge and skills in decision support systems, their classification (Powerova), selected principles of data-oriented, model-oriented and knowledge-oriented decision support systems. Students will also gain knowledge of multicriterial decision-making methods and game theory. They will also learn about the principles of conceptually and ontologically oriented decision support systems and the basics of distribution, optimization and evolution methods and algorithms.			

NI-TES	Systems Theory	Z,ZK	5
Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However, 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.			
NI-TSP	Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to prepare a test set with the help of the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with built-in-self-test equipment. They will be able to compute, analyze, and control the reliability and availability of the designed circuits.			
NI-TSW	Software Product Development	KZ	4
The course is presented in Czech.			
NI-UMI	Artificial intelligence	Z,ZK	5
The course covers search and inference algorithms in major formal paradigms used in artificial intelligence such as logic theories, constraint programming and automated planning. The main principles and practical applications of discussed techniques will be illustrated.			
NI-EHW	Embedded Hardware	Z,ZK	5
The course brings basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is the base of 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.			
NI-ESW	Embedded Software	Z,ZK	5
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the 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.			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies 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).			
NI-APR	Selected Methods for Program Analysis	Z,ZK	5
This course introduces you to program analysis, i.e., the automated reasoning about the behavior of a computer program. We will cover static and dynamic analysis. In Static Analysis, we will look at the art of reasoning about computer programs without running them. We will look at the analyses for program understanding, optimizations, error detection. In Dynamic Analysis, we will look at the analyses considering individual program runs using a concrete environment and inputs.			
NI-PON	Selected Topics in Optimization and Numerical mathematics	Z,ZK	5
The course focuses on optimization problems that appear in the field of machine learning and artificial intelligence. Students broaden their knowledge of continuous optimization obtained in the course Mathematics for informatics. The methods are explained and described along with the details on how they are implemented on computers. Hence, the relevant concepts of numerical matematics, mainly numerical linear algebra, are explained too.			
NI-VMM	Retrieval from Multimedia	Z,ZK	5
The student obtains general knowledge regarding interfaces of portals providing multimedia content, the principles of similarity search, the methods of feature extraction from multimedia objects, indexing, and structure of distributed search engines.			
NI-MCC	Multicore CPU Computing	Z,ZK	5
Students will get acquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations on multicore processors with shared and virtually shared memories, which are today the most common computing nodes of powerful (super)computer systems. Students will gain knowledge of architecturally specific optimization techniques used to reduce the performance drop due to the widening gap between the computational requirements of multi-core CPUs and memory interface throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.			
FITE-SEP	World Economy and Business	Z,ZK	4
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries 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.			

List of courses of this pass:

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

BI-ACM4	Programming Practices 4	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM1	Programming Practices 1	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM2	Programming Practices 2	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM3	Programming Practices 3	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM4	Programming Practices 4	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM5	Programming Practices 5	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ACM6	Programming Practices 6	KZ	5
	This is a selective course for preparing talented student for representation in international programming contests.		
FIT-ITI	Modern IT infrastructure	Z,ZK	5
	with a very limited and time-invariable range of software or hardware, this subject tries to explain the issue as a whole and in the context of the time. A modern data or computing center is understood here as a complex whole, the individual parts of which must be reconciled from different aspects of the view using current technologies. The proposed solution should thus be capable of continuous and economically optimal operation.		
FIT-SEP	World Economy and Business	Z,ZK	4
	This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by 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.		
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.		
FITE-GRI	Grid Computing	Z,ZK	5
	Grid computing and gain knowledge about the world-wide network and computing infrastructure.		
FITE-SEP	World Economy and Business	Z,ZK	4
	The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries 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.		
NI-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).		
NI-ADP	Architecture and Design patterns	Z,ZK	5
	The objective of this course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysis as well as with understanding of the challenges, issues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowledge of object-oriented programming and get familiar with the commonly used object-oriented design patterns that represent the best practices for solving common software design problems. In the second part the students will be introduced to the principles of software architecture design and analysis. This includes the classical architectural styles, component based systems, and some advanced software architectures used in large-scale distributed systems.		
NI-AIB	Algorithms of Information Security	Z,ZK	5
	Students will get acquainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, students will learn the mathematical principles of cryptographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware detection and the use of machine learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic systems.		
NI-AM1	Middleware Architectures 1	Z,ZK	5
	Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information 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.		
NI-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.		
NI-APR	Selected Methods for Program Analysis	Z,ZK	5
	This course introduces you to program analysis, i.e., the automated reasoning about the behavior of a computer program. We will cover static and dynamic analysis. In Static Analysis, we will look at the art of reasoning about computer programs without running them. We will look at the analyses for program understanding, optimizations, error detection. In Dynamic Analysis, we will look at the analyses considering individual program runs using a concrete environment and inputs.		
NI-BKO	Error Control Codes	Z,ZK	5
	The goal of the course is to present various ways to detect or correct individual errors and burst errors in data stored into memories or transmitted via channels.		
NI-BML	Bayesian Methods for Machine Learning	KZ	5
	The subject is focused on practical use of basic Bayesian modeling methods in the dynamically evolving machine learning theory. In particular, it studies the construction of appropriate models providing description of real phenomena, as well as their subsequent use, e.g., for forecasting of future evolution or learning about the hidden variables (true object position from noisy observations etc.). The emphasis is put on understanding of explained principles and methods and their practical adoption. For this purpose, a number of real world examples and applications will be presented to students, for instance, 2D/3D object tracking, radiation source term estimation, or separation in medical imaging. The students will try to solve some of them.		

NI-BUI	Business Informatics	Z,ZK	5
The aim of the course is to focus on operational, tactical and strategic management of business informatics. Students will gain knowledge in the areas of business process management, ICT services and architectures in enterprise informatics. They will also learn about the principles, models and standards (ITIL, COBIT) in IT management, and lifecycle management of ICT services and resource management (sourcing). Students will learn the process of creating and implementing information strategy, IT Governance, the importance of ICT for business and the context of information strategy with global business strategy. They will also gain knowledge in the areas of economic IT management, revenue and investment management, IT investment evaluation and human resources management in IT (roles CIO, CEO, CFO).			
NI-BVS	Embedded Security	Z,ZK	5
Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of cryptographic primitives in hardware and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources for securing internal functions of computer systems.			
NI-DDW	Web Data Mining	Z,ZK	5
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.			
NI-DSS	Decision Support Systems	Z,ZK	5
The aim of the course is to provide students with knowledge and skills in decision support systems, their classification (Powerova), selected principles of data-oriented, model-oriented and knowledge-oriented decision support systems. Students will also gain knowledge of multicriterial decision-making methods and game theory. They will also learn about the principles of conceptually and ontologically oriented decision support systems and the basics of distribution, optimization and evolution methods and algorithms.			
NI-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 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.			
NI-EHW	Embedded Hardware	Z,ZK	5
The course brings basic laws that govern digital design and basic techniques to use them. It deals with both large and small scale systems. This is the base of 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.			
NI-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.			
NI-ESW	Embedded Software	Z,ZK	5
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the 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.			
NI-EVY	Efficient Text Pattern Matching	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.			
NI-FME	Formal Methods and Specifications	Z,ZK	5
Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some software tools that allow to prove basic properties of software.			
NI-GAK	Graph theory and combinatorics	Z,ZK	5
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.			
NI-GEN	Code Generators	Z,ZK	5
Advanced techniques of translating programs written in high-level programming languages are essential for understanding the field of systems programming. This primarily involves understanding the algorithms and techniques used to translate more complex programming constructs of modern languages employed in systems programming. Students will become familiar with both the theoretical and practical aspects of implementing the back-end of optimizing compilers for programming languages.			
NI-GPU	GPU Architectures and Programming	Z,ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the 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.			
NI-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.			
NI-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.			
NI-KRY	Advanced Cryptology	Z,ZK	5
Students will learn the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the mathematical principles of random number generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they can apply to the integration of their own systems or to the creation of their own software solutions.			
NI-MCC	Multicore CPU Computing	Z,ZK	5
Students will get acquainted in detail with hardware support and programming technologies for the creation of parallel multithreaded computations on multicore processors with shared and virtually shared memories, which are today the most common computing nodes of powerful (super)computer systems. Students will gain knowledge of architecturally specific optimization techniques used to reduce the performance drop due to the widening gap between the computational requirements of multi-core CPUs and memory interface throughput. On specific non-trivial multithreaded programs, students will also learn the basics of the art of creating these applications.			
NI-MEP	Modelling of Enterprise Processes	Z,ZK	5
The subject is focused on introduction to the discipline of Enterprise Engineering. Students learn the importance of a proper methodological approach for (re)engineering and implementation of processes, organisation structures and information support in big enterprises and institutions.			

NI-MKY	Mathematics for Cryptology	Z,ZK	5
Students will gain deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In particular, the course focuses on the problem of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discrete logarithm. The problem of factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.			
NI-MPJ	Modelling of Programming Languages	Z,ZK	5
The analysis, transformation, and code generation processes depend on the semantics of the language; in particular, they are correct if they preserve the semantics of the language. This course explores the semantics of programming languages. The students will learn the language models with emphasis on functional languages, students are expected to understand the basics of the lambda calculus and here get acquainted with the advanced lambda calculus. The students also get hands-on-experience with semantic modeling and execution tools.			
NI-MTI	Modern Internet Technologies	Z,ZK	5
SYNOPSIS The subject "Modern Internet Technologies" is designed on four major pillars of networking: 1. Unified Communication and Collaboration - A single network, oriented on TCP/IP is able to carry whatever types of protocols for whatever purposes. This architecture is able to be protocol independent and carries voice, video and data to achieve seamless integrated services. 2. Design of Extremely Scalable Networks - This provides the insights of network architectures which can accommodate hundreds of millions of users and billions of devices. Thus, there is a paradigm switch from LANs (Local Area Networks) to SPs (Service Providers). 3. Traffic Segregation, Traffic Matching and Traffic Prioritisation - These technologies allow service providers to create private channels of communication between customers, with guaranteed parameters (bandwidth, delay, jitter, type of protocol). 4. Acceleration Technologies - They allow traffic to be carried at the optimal speed and allow for graceful degradation of service parameters in case of failures.			
NI-MVI	Computational Intelligence Methods	Z,ZK	5
Students will understand methods and techniques of computational intelligence that are mostly nature-inspired, parallel by nature, and applicable to many problems. They will learn how these methods work and how to apply them to problems related to data mining, control, intelligen games, optimizations, etc.			
NI-NON	Nonlinear Continuous Optimization and Numerical Methods	Z,ZK	5
Students will be introduced to nonlinear continuous optimization, principles of the most popular methods of optimization and applications of such 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.			
NI-NSS	Normalized Software Systems	ZK	5
Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from 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.			
NI-NUR	User Interface Design	Z,ZK	5
Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs.			
NI-OSY	Operating Systems and Systems Programming	Z,ZK	5
The course covers system programming in UNIX environment. Emphasis is given on kernel development with focus on kernel architecture and kernel data structures. Key topics are: process management, memory management, file operations and architecture of modern file systems, device drivers and network programming.The course also addresses kernel development process, upgrades of existing kernels, kernel booting, debugging using dynamic instrumentation, and techniques to guarantee portability. Specifics of kernel architecture in embedded and real-time operating systems are also discussed. Theoretical and general principles are demonstrated on the LINUX kernel. Within labs, students will work on projects focused on development of LINUX kernel modules.			
NI-PAS	Advanced Aspects of Business	Z,ZK	4
The aim of the course is to provide students with advanced (compared to the bachelor's degree) knowledge and skills needed to establish and run their own business or business management, especially in law, administration (necessary steps and documents), business economics, foreign trade and related aspects.			
NI-PDB	Advanced Database Systems	Z,ZK	5
Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of 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.			
NI-PDD	Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data sources, such as images, texts, time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteristics from images or from web pages.			
NI-PIS	Enterprise Information Systems	Z,ZK	5
The course is focused on the current IT requirements of large companies in the Czech Republic (Top 100). The basis is Data management, storage of big data (BigData) and their use in BI (Business Intelligence). The principles of solving the overall architecture of information systems in the banking, insurance and telecommunications sectors will be explained on real examples. Furthermore, students will get acquainted with the life cycle of information systems in the company / organization and its impact on the business strategy of the company. Students will be acquainted with technologies that have proven themselves in the elimination of basic risks in the planning, implementation and operation of information systems in the company / organization.			
NI-PON	Selected Topics in Optimization and Numerical mathematics	Z,ZK	5
The course focuses on optimization problems that appear in the field of machine learning and artificial intelligence. Students broaden their knowledge of continuous optimization obtained in the course Mathematics for informatics. The methods are explained and described along with the details on how they are implemented on computers. Hence, the relevant concepts of numerical matematics, mainly numerical linear algebra, are explained too.			
NI-REV	Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before and after the main function is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated to reverse engineering of applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be dedicated to debuggers: how debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer malware scene. The focus of the course is on the seminars, where students will solve practically oriented tasks from the real world.			
NI-RUN	Runtime Systems	Z,ZK	5
This course is an introduction to the world of virtual machines (VM) for high-level programming languages. There are two goals: Give you hands-on experience in design and implementation of a compiler and a VM from scratch, including Abstract Syntax Tree (AST) interpretation Byte code (BC) design and interpretation AST to BC compilation Memory management Just-in-time compilation and some optimization techniques Through a series of guest lectures, introduce you to various advanced topics and implementations of real-world VMs, including Dynamic optimizations, speculations, and deoptimizations Language implementation frameworks Read-world VMs			

NI-SBF	System Security and Forensics	Z,ZK	5
Students will get familiar with aspects of system security (principles of end station security, principles of security policies, security models, authentication concepts). Furthermore, students will get familiar with forensic analysis as a tool for investigating security incidents (techniques used by malicious software/attackers and forensic analysis techniques and the importance of operating system/operating system artifacts or file system for attack analysis and detection).			
NI-SCR	Statistical Analysis of Time Series	Z,ZK	5
The course deals with the practical use of the basic time series modelling theory in engineering tasks, ranging from economics (stock exchange prices, employment) and industrial problems (modelling of signals and processes) to computer networks (network components load, attacks detection). The students learn to select a convenient process model, estimate its parameters, analyze its properties and use it for forecasting of future or intermediate values. The stress is put on understanding and adoption of the main principles based on practical real-world examples. Both the lab classes and the lectures exploit freely available software packages in order to provide easy and straightforward transfer of students' knowledge from the academic to the real world.			
NI-SIB	Network Security	Z,ZK	5
NI-SIM	Digital Circuit Simulation and Verification	Z,ZK	5
The aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers recent verification methods, too.			
NI-SLA	Sublinear algorithms	Z,ZK	5
We will introduce three methods to tackle algorithms working in sublinear space.			
NI-SWE	Semantic Web and Knowledge Graphs	Z,ZK	5
The students will learn the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web technologies, methods and best practices for modelling, integration, publishing, querying and consumption of semantic data. The students will also gain skills in creation of knowledge graphs and their systematic quality assurance.			
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.			
NI-TES	Systems Theory	Z,ZK	5
Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However, 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.			
NI-TSP	Testing and Reliability	Z,ZK	5
Students will gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to prepare a test set with the help of the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with built-in-self-test equipment. They will be able to compute, analyze, and control the reliability and availability of the designed circuits.			
NI-TSW	Software Product Development	KZ	4
The course is presented in Czech.			
NI-UMI	Artificial intelligence	Z,ZK	5
The course covers search and inference algorithms in major formal paradigms used in artificial intelligence such as logic theories, constraint programming and automated planning. The main principles and practical applications of discussed techniques will be illustrated.			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies 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).			
NI-VMM	Retrieval from Multimedia	Z,ZK	5
The student obtains general knowledge regarding interfaces of portals providing multimedia content, the principles of similarity search, the methods of feature extraction from multimedia objects, indexing, and structure of distributed search engines.			
NIE-ADP	Architecture and Design patterns	Z,ZK	5
The objective of this course is to provide students with both work knowledge about the underlying foundations of object-oriented design and analysis as well as with understanding of the challenges, issues, and tradeoffs of advanced software design. In the first part of the course, the students will refresh and deepen their knowledge of object-oriented programming and get familiar with the commonly used object-oriented design patterns that represent the best practices for solving common software design problems. In the second part the students will be introduced to the principles of software architecture design and analysis. This includes the classical architectural styles, component based systems, and some advanced software architectures used in large-scale distributed systems.			
NIE-AIB	Algorithms of Information Security	Z,ZK	5
Students will get acquainted with the algorithms of secure key generation and cryptographic error (not only biometric) data processing. Furthermore, students will learn the mathematical principles of cryptographic protocols (identification, authentication, and signature schemes). Another part of the course is dedicated to malware detection and the use of machine learning in detection systems. The last topic includes practical steganographic methods and attacks on steganographic systems.			
NIE-AM1	Middleware Architectures 1	Z,ZK	5
Students will study new trends, concepts, and technologies in the area of service-oriented architectures. The will gain an overview of information 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.			
NIE-BKO	Error Control Codes	Z,ZK	5
The course expands the basic knowledge of security codes used in current systems for error detection and correction. It provides the necessary 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-BVS	Embedded Security	Z,ZK	5
Students gain basic knowledge in selected topics of cryptography and cryptanalysis. The course focuses particularly on efficient implementations of cryptographic primitives in hardware and software (in embedded systems). Students gain a good overview of functionality of (hardware) cryptographic accelerators, smart cards, and resources for securing internal functions of computer systems.			
NIE-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 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.			

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	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-ESW	Embedded Software	Z,ZK	5
Embedded software course acquainted students with the specifics of software development for embedded systems. The course covers the areas from the basic techniques of programming in C language and code optimizations, through typical areas as the reliable software development, embedded operating systems, signal processing, up to sophisticated techniques combined with artificial intelligence.			
NIE-FME	Formal Methods and Specifications	Z,ZK	5
Students are able to describe semantics of software formally and to use sound reasoning for construction of correct software. They learn to use some software tools that allow to prove basic properties of software.			
NIE-GPU	GPU Architectures and Programming	Z,ZK	5
Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the CUDA 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-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-KRY	Advanced Cryptology	Z,ZK	5
Students will learn the essentials of cryptanalysis and the mathematical principles of constructing symmetric and asymmetric ciphers. They will know the mathematical principles of random number generators. They will have an overview of cryptanalysis methods, elliptic curve cryptography and quantum cryptography, which they can apply to the integration of their own systems or to the creation of their own software solutions.			
NIE-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.			
NIE-MKY	Mathematics for Cryptology	Z,ZK	5
Students will gain deeper knowledge of algebraic procedures solving the most important mathematical problems concerning the security of ciphers. In particular, the course focuses on the problem of solving a system of polynomial equations over a finite field, the problem of factorization of large numbers and the problem of discrete logarithm. The problem of factorization will also be solved on elliptic curves. Students will further become familiar with modern encryption systems based on lattices.			
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 technologies of modern internet, including multimedia data transfer, with various types of network virtualization, and with last-mile security.			
NIE-NSS	Normalized Software Systems	ZK	5
Students will learn the foundations of normalized systems theory that studies the evolvability of modular structures based on concepts from 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-NUR	User Interface Design	Z,ZK	5
Students will understand the theorical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental notions and procesures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs.			
NIE-PDB	Advanced Database Systems	Z,ZK	5
Students orient themselves in problems of evaluation and optimization of SQL queries. The next part of the course deals with new concepts of 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	5
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-REV	Reverse Engineering	Z,ZK	5
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	5
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-SIB	Network Security	Z,ZK	5
The students will gain theoretical and practical knowledge and experience in the area of current security threats in computer networks, specifically 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	5
Aim of the course is to acquaint the students with principles of digital circuit simulation at RTL (Register Transfer Level) and TLM (Transaction Level Modeling) levels and with the properties of proper tools. The course covers today recent verification methods, too.			

NIE-TES	Systems Theory	Z,ZK	5
Today, humankind has the ability to develop systems of incredible complexity (e.g., trains, microprocessors, airplanes, nuclear power plants). However, 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.			
NIE-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and organizations. They will get acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiently operate and optimize the performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effective technology today for the management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in the use of modern integration and development tools (Continuous integration and development).			
UNI-ADS	Algorithms and data structures	Z,ZK	7
The course covers the most basic of the efficient algorithms, data structures and graph theory that every computer scientist should know. As part of the exercise, students are introduced to the use of explained algorithms for solving practical problems. Furthermore, students gain basic knowledge of the design and use of finite automata, regular expressions, the use of context-free grammars and the design and use of stack automata. They are introduced to the Turing machine and to the complexity classes P and NP.			
UNI-DI1	Didactics of Informatics I	Z,ZK	6
The course builds on the subjects General Pedagogy and General Didactics and applies the acquired knowledge to didactics in the field of informatics and related technologies. The student will get acquainted with the ways of theoretical teaching of information technologies and in connection with their practical practice and verification of knowledge.			
UNI-DI2	Didactics of Informatics II	KZ	7
The course builds on the subject Didactics of Informatics I and applies the knowledge to the practical use of evaluation tools for various types of tests Moodle (theory), Marast (examples, mathematics, informatics), Progtest (programs in C/C++), LearnShell (bash scripts). Students learn to work with the tools, prepare/program examples and test them on each other. Students get acquainted and help with preparing real tests from selected topics, get acquainted and help with the preparation of programming competitions for secondary school. The course is significantly built on independent work and processing of semester project (this corresponds to the credit load).			
UNI-DIP	Diploma Thesis	Z	9
The eaching is based on individual consultations with the supervisor of the thesis or another consultant (didactic part). The scope of the 9 ECTS lessons (i.e. about 270 hours) includes consultations, preparation of the theoretical part, practical part, writing and defence of the thesis before the commission.			
UNI-IB	Information security	Z,ZK	5
The course covers the area of description of basic cryptographic schemes and also introduces students to the basics of network and system security. Great attention is paid to current topics of cyber security, such as ethical hacking, penetration testing and malware. At the end of the course students are introduced to the issues of secure programming, security of web applications. Student learns how to avoid traps that can be set for users and thus basics of safe behavior of users and risk minimization.			
UNI-MTUI	Modern technology and artificial intelligence	Z,ZK	5
Students will get acquainted with selected tools that can be used for data acquisition and processing and subsequently for their analysis and visualization. Using real data and problems, the basics of machine learning and artificial intelligence will be explained. In the next part of the course, the acquired knowledge will be used to work with tools for working with image data. In the last part of the course, students will get acquainted with the basics of robotics, especially agent systems and motion planning.			
UNI-PPP	Propedeutics of pedagogical practice	KZ	6
The course is focused on the preparation of students for lessons before teaching practice.			
UNI-PS	Computers and networks	Z,ZK	6
Students are generally explained the principles of the internal organization and architecture of computer systems. Using simple examples, they will understand how a standard multi-core, vector- and GPU-accelerated computer connected to the Internet processes, stores and sends data in a multi-user operating system. The work at the command-line level penetrates the entire subject and will be explained continuously.			
UNI-RPP	Reflection of teaching practice	Z	3
In the practically focused subject, special attention will be paid to the joint search for suitable solutions to the most common difficulties of pedagogical practice, as well as to effective ways of coping with dynamic changes in contemporary education. Teaching mainly builds on the targeted building of a safe space to reflect one's own dispositions for learning, to share and process emotions as well as challenging topics from practice, including presentation and communication of students' first pedagogical outputs. Procedures included: structured discussion, feedback interviews and mentoring.			
UNI-SPD	Semester project for thesis	Z	3
The aim of the course is to deepen standards and requirements for theses. It takes place mainly in the form of individual consultations with supervisors of theses and independent work. At the beginning of the course there is a block meeting with students, which introduces the student to the requirements for theses and the interconnection of professional and didactic issues. Total burden in the range of 3 ECTS. The student prepares a research of resources according to the supervisor's request, chooses a method of work, or prepares a separate chapter.			
UNI-SPP	Continuous teaching practice	KZ	15
Before entering the practice, the student undergoes the propedeutic of the teaching practice. The first part of the direct practice includes, in particular, hospitalization at a particular school and the processing of hospitalization protocols. In the next part, students also directly enter the lessons and engage in activities related to the running of the school. At least 192 hours participate in the direct teaching activity, of which 96 hours directly teach either alone or in a couple. Home preparation for teaching, protocol processing, etc., i.e. a total of 450 hours is included in the 15 credits.			
UNI-TP	Computer technology	Z,ZK	6
The course practically focuses on embedded systems and low-level software. It explains that the basis is the design of algorithms and their implementation, whether in hardware or in software, with regard to limiting conditions (size, speed, reliability). Topics are discussed in an overview form and practiced on specific examples in the laboratory. Laboratory exercises are aimed at getting students acquainted with teaching methods, e.g. how to show that there is not only reconfigurable software (a program in rewritable memory) but also hardware (FPGA). It demonstrates how to adapt tasks to the teaching of secondary school students and their expected knowledge, e.g. by means of interactive tutorials.			
UNI-VSA	Development of SW applications	Z,ZK	6
The lectures consist of topics devoted to methodology, SW systems architectures, technology platforms as well as support tools used in practice shared code repositories, CI/CD (Continuous Integration / Continuous Delivery) tools, application repositories (Google Play, App Store, Github, Gitlab,). The space will also be devoted to the use of SW components and services provided to developers, often free of charge (cloud storage, bug logging, authentication/authorization using Google or Facebook accounts and others). The seminars/exercises are designed so that students can try out at least one of many possible ways of developing and deploying a simple SW application.			

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