Doporučený průchod studijním plánem

Název průchodu: Master specialization Software Engineering, in English, 2021

Fakulta: Fakulta informačních technologií
Katedra:
Průchod studijním plánem: Master specialization Software Engineering, in English, 2021
Obor studia, garantovaný katedrou: Úvodní stránka
Garant oboru studia:
Program studia: Informatics
Typ studia: Navazující magisterské prezenční
Poznámka k průchodu: ~Compulsory courses of neighboring specializations can be enrolled as optional ones.

Kódování rolí předmětů a skupin předmětů:
P - povinné předměty programu, PO - povinné předměty oboru, Z - povinné předměty, S - povinně volitelné předměty, PV - povinně volitelné předměty, F - volitelné předměty odborné, V - volitelné předměty, T - tělovýchovné předměty

Kódování způsobů zakončení predmětů (KZ/Z/ZK) a zkratek semestrů (Z/L):
KZ - klasifikovaný zápočet, Z - zápočet, ZK - zkouška, L - letní semestr, Z - zimní semestr

Číslo semestru: 1

Kód	Název předmětu / Název skupiny předmětů *(u skupiny předmětů seznam kódů jejích členů)* *Vyučující, **autoři** a garanti (gar.)*	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-KOP	**Combinatorial Optimization** *Petr Fišer, Jan Schmidt **Petr Fišer** Petr Fišer (Gar.)*	Z,ZK	6	3P+1C	Z	PP
NIE-MPI	**Mathematics for Informatics** *Francesco Dolce **Štěpán Starosta** Štěpán Starosta (Gar.)*	Z,ZK	7	3P+2C	Z	PP
NIE-ADP	**Architecture and Design patterns** *Jiří Borský **Jiří Borský** Filip Křikava (Gar.)*	Z,ZK	5	2P+1C	Z	PS
NIE-AM1	**Middleware Architectures 1** *Milan Dojčinovski, Tomáš Vitvar, Jaroslav Kuchař **Jaroslav Kuchař** Tomáš Vitvar (Gar.)*	Z,ZK	5	2P+1C	Z	PS
NIE-V.21	**Purely elective master's courses** *NIE-BLO,NIE-CPX,..... (pokračování viz seznam skupin níže)*	Min. předm. 0 Max. předm. 31	Min/Max 0/136			V

Číslo semestru: 2

Kód	Název předmětu / Název skupiny předmětů *(u skupiny předmětů seznam kódů jejích členů)* *Vyučující, **autoři** a garanti (gar.)*	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-PDP	**Parallel and Distributed Programming** *Pavel Tvrdík **Pavel Tvrdík** Pavel Tvrdík (Gar.)*	Z,ZK	6	2P+2C	L	PP
NIE-VSM	**Selected statistical Methods** *Petr Novák **Pavel Hrabák** Pavel Hrabák (Gar.)*	Z,ZK	7	4P+2C	L	PP
NIE-PIS	**Advanced Information Systems** *Petra Pavlíčková, Petr Kroha **Petra Pavlíčková** Petr Kroha (Gar.)*	Z,ZK	5	2P+1C	L	PS
NIE-FME	**Formal Methods and Specifications** *Stefan Ratschan **Stefan Ratschan** Stefan Ratschan (Gar.)*	Z,ZK	5	2P+1C	L	PS
NIE-NSS	**Normalized Software Systems** *Robert Pergl, Marek Suchánek, Jan Verelst **Robert Pergl** Robert Pergl (Gar.)*	ZK	5	2P	L	PS
NIE-V.21	**Purely elective master's courses** *NIE-BLO,NIE-CPX,..... (pokračování viz seznam skupin níže)*	Min. předm. 0 Max. předm. 31	Min/Max 0/136			V

Číslo semestru: 3

Kód	Název předmětu / Název skupiny předmětů *(u skupiny předmětů seznam kódů jejích členů)* *Vyučující,* ***autoři*** *a garanti (gar.)*	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-MPR	**Master Project** ***Zdeněk Muzikář*** *Zdeněk Muzikář (Gar.)*	Z	7		Z,L	PP
NIE-PDB	**Advanced Database Systems** *Martin Svoboda* ***Martin Svoboda*** *Martin Svoboda (Gar.)*	Z,ZK	5	2P+1C	Z	PS
NIE-NUR	**User Interface Design** *Josef Pavlíček* ***Josef Pavlíček*** *Josef Pavlíček (Gar.)*	Z,ZK	5	2P+1C	Z	PS
NIE-PV-SI.21	**Compulsory Elective Master Courser for Specialization Software Engineering, version 2021** *NIE-DSS,NIE-MEP,..... (pokračování viz seznam skupin níže)*	Min. předm. 1 Max. předm. 3	Min/Max 4/14			PV
NIE-V.21	**Purely elective master's courses** *NIE-BLO,NIE-CPX,..... (pokračování viz seznam skupin níže)*	Min. předm. 0 Max. předm. 31	Min/Max 0/136			V

Číslo semestru: 4

Kód	Název předmětu / Název skupiny předmětů *(u skupiny předmětů seznam kódů jejích členů)* *Vyučující,* ***autoři*** *a garanti (gar.)*	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-DIP	**Diploma Project** *Zdeněk Muzikář* ***Zdeněk Muzikář*** *Zdeněk Muzikář (Gar.)*	Z	30	270ZP	L,Z	PP

Seznam skupin předmětů tohoto průchodu s úplným obsahem členů jednotlivých skupin

Kód	Název skupiny předmětů a kódy členů této skupiny předmětů (specifikace viz zde nebo níže seznam předmětů)	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-PV-SI.21	**Compulsory Elective Master Courser for Specialization Software Engineering, version 2021**	**Min. předm. 1** **Max. předm. 3**	**Min/Max** 4/14			**PV**

NIE-DSS	Decision Support Systems	NIE-MEP	Modelling of Enterprise Processe ...	NIE-TSW	Software Product Development

Kód	Název skupiny předmětů a kódy členů této skupiny předmětů (specifikace viz zde nebo níže seznam předmětů)	Zakončení	Kredity	Rozsah	Semestr	Role
NIE-V.21	**Purely elective master's courses**	**Min. předm. 0** **Max. předm. 31**	**Min/Max** 0/136			**V**

NIE-BLO	Blockchain	NIE-CPX	Complexity Theory	NIE-VYC	Computability
NIE-MVI	Computational Intelligence Metho ...	NIE-ARI	Computer arithmetic	NIE-SCE1	Computer Engineering Seminar Mas ...
NIE-SCE2	Computer Engineering Seminar Mas ...	NI-DSW	Design Sprint	NI-DID	Digital drawing
NIE-EVY	Efficient Text Pattern Matching	NI-GLR	Games and reinforcement learning	NI-GRI	Grid Computing
NIE-HMI	History of Mathematics and Infor ...	NIE-DVG	Introduction to Discrete and Com ...	FITE-EHD	Introduction to European Economi ...
MIE-MZI	Mathematics for data science	NIE-AM2	Middleware Architectures 2	NIE-OSY	Operating Systems and Systems Pr ...
NIE-PAM	Parameterized Algorithms	NIE-SYP	Parsing and Compilers	NIE-ROZ	Pattern Recognition
NIE-PML	Personalized Machine Learning	NI-AML	Pokročilé techniky strojového uč ...	NIE-PDL	Practical Deep Learning
FIT-ACM1	Programovací praktika 1	FIT-ACM2	Programovací praktika 2	FIT-ACM3	Programovací praktika 3
FIT-ACM4	Programovací praktika 4	FIT-ACM5	Programovací praktika 5	FIT-ACM6	Programovací praktika 6
NIE-VPR	Research Project	NIE-SWE	Semantic Web and Knowledge Graph ...	MI-SCE1	Seminář počítačového inženýrství ...
NIE-HSC	Side-Channel Analysis in Hardwar ...	NIE-DDW	Web Data Mining	NIE-BPS	Wireless Computer Networks
NIE-SEP	World Economy and Business	FITE-SEP	World Economy and Business		

Seznam předmětů tohoto průchodu:

Kód	Název předmětu	Zakončení	Kredity
FIT-ACM1	Programovací praktika 1	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FIT-ACM2	Programovací praktika 2	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FIT-ACM3	Programovací praktika 3	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FIT-ACM4	Programovací praktika 4	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FIT-ACM5	Programovací praktika 5	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FIT-ACM6	Programovací praktika 6	KZ	5
	Tento výběrový kurz má za cíl připravit ty nejlepší studenty na reprezentaci fakulty v rámci mezinárodních ACM soutěží.		
FITE-EHD	Introduction to European Economic History	Z,ZK	3
	The course introduces a selection of themes from European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key historical periods. As European countries have been dominant actors in this process it focuses predominantly on their roles in economic history. From the large economic area of the Roman Empire to the fragmentation of the Middle Ages, from the destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover the detailed economic history of particular European countries but rather the impact of trade and the role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lectures and discussions.		
FITE-SEP	World Economy and Business	Z,ZK	4
	The course introduces students of technical universities to international business. It does that predominantly by comparing individual countries and key regions of the 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 knowledge in the form of discussions based on individual readings.		
MI-SCE1	Seminář počítačového inženýrství I	Z	4
	Seminář počítačového inženýrství je výběrový předmět pro studenty, kteří se chtějí zabývat hlouběji tématy číslicového návrhu, spolehlivosti a odolnosti proti poruchám a útokům. Ke studentům se v rámci předmětu přistupuje individuálně a každý student či skupinka studentů řeší nějaké zajímavé aktuální téma s vybraným školitelem. Součástí předmětu je práce s vědeckými články a jinou odbornou literaturou a/nebo práce v laboratořích KČN. Kapacita předmětu je omezena možnostmi učitelů semináře. Probíraná témata jsou pro každý semestr nová.		
MIE-MZI	Mathematics for data science	Z,ZK	4
	In this course, the students are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used in data science. The studied topics include mainly: linear algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality principle, gradient methods) and selected notions from probability theory and statistics.		
NI-AML	Pokročilé techniky strojového učení	Z,ZK	5
	Předmět seznamuje studenty s vybranými pokročilými tématy strojového učení a umělé inteligence a jejich aplikace na reálné problémy. Témata představují techniky v oblasti doporučovacích systémů, zpracování obrazu, řízení i propojení fyzikálních zákonů s oblastí strojového učení. Cílem cvičení je podrobně seznámit studenty s probíranými metodami.		
NI-DID	Digital drawing	Z	2
	Předmět má za cíl přiblížit studentům základní principy digitální kresby a grafické tvorby. Studenti získají povědomí o základech kompozice, perspektivy i teorie barev, což následně budou aplikovat ve svých samostatných pracích. Studenti také získají zkušenosti s kresbou v průběhu praktických cvičení. Kurz je vhodný pro kohokoli s chutí více kreslit a malovat, jelikož právě to je nedílnou součástí výuky. Předmět bude organizovaný formou tematických cvičení pokrývajících část teorie a tvůrčích cvičení, která jsou zaměřena na procvičování.		
NI-DSW	Design Sprint	Z	2
	Studenti budou pracovat metodou design sprint, vyvinutou původně společností Google, díky které lze během 5 dnů přejít od nápadu přes testování až k finálnímu návrhu produktu nebo služby. Během kurzu se seznámí s metodou Design Sprint z pohledu účastníka. Na praktickém problému si vyzkouší celý 5ti denní proces od výzkumu po testování prototypů. Díky zařazení před začátek semestru mají studenti možnost vyzkoušet si metodu, která vyžaduje kontinuálnější časovou alokaci než běžná výuka.		
NI-GLR	Games and reinforcement learning	Z,ZK	4
	The field of reinforcement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligence. This course is intended to give you both theoretical and practical background so you can participate in related research activities. Presented in English.		
NI-GRI	Grid Computing	Z,ZK	5
	Grid computing and gain knowledge about the world-wide network and computing infrastructure.		
NIE-ADP	Architecture and Design patterns	Z,ZK	5
	The aim of this course is to provide students with practical knowledge of the basic principles of object-oriented design and its analysis, together with an understanding of the challenges, questions and compromises associated with advanced software design. In the first part of the course, students will review and deepen their knowledge of object-oriented programming and learn the most commonly used design patterns, which represent the best practices for solving typical software design problems. In the second part of the course, students will be introduced to the principles of design and analysis of software architecture including classical architectural designs, component systems and some advanced software architectures of large distributed systems. If you need to contact the teacher of NIE-ADP, please write an e-mail to Ing. Jiri Borsky borskjir@fit.cvut.cz		
NIE-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-AM2	Middleware Architectures 2	Z,ZK	5
	Students will learn new trends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architectures, concepts and technologies for microservices, distrubuted cache and databases, smart contracts, realtime communication and web security.		
NIE-ARI	Computer arithmetic	Z,ZK	4
	Students will learn various data representations used in digital devices and will be able to design arithmetic operations implementation units.		

NIE-BLO	Blockchain	Z,ZK	5
Students will understand the foundations of blockchain technology, smart contract programming, and gain an overview of most notable blockchain platforms. They will be able to design, code and deploy a secure decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course places an increased emphasis on the relationship between blockchains and information security. It is concluded with a defense of a research or applied semester project, which prepares the students for implementing or supervising implementation of blockchain-based solutions in both academia and business.			
NIE-BPS	Wireless Computer Networks	Z,ZK	4
Students will learn about the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in ad-hoc networks, multicast and broadcast mechanisms, and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get knowledge of security mechanisms for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools.			
NIE-CPX	Complexity Theory	Z,ZK	5
Students will learn about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the theory concerning practical (in)tractability of difficult problems.			
NIE-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.			
NIE-DIP	Diploma Project	Z	30
NIE-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.			
NIE-DVG	Introduction to Discrete and Computational Geometry	Z,ZK	5
The course intends to introduce the students to the discipline of Discrete and Computational Geometry. The main goal of the course is to get familiar with the most fundamental notions of this discipline, and to be able to solve simple algorithmic problems with a geometric component.			
NIE-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.			
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-HMI	History of Mathematics and Informatics	Z,ZK	3
The course focuses on selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer science The topics are selected for finding some relations between computer science and mathematical methods. Some examples of applications of mathematics to computer sciences will be showed.			
NIE-HSC	Side-Channel Analysis in Hardware	Z,ZK	4
This course is dedicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attacks. Students get familiar with various kinds of side channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and get familiar with higher-order attacks. They also get practice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel information leakage.			
NIE-KOP	Combinatorial Optimization	Z,ZK	6
The students will gain knowledge and understanding necessary deployment of combinatorial heuristics at a professional level. They will be able not only to select and implement but also to apply and evaluate heuristics for practical problems.			
NIE-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.			
NIE-MPI	Mathematics for Informatics	Z,ZK	7
The course focuses on selected topics from general algebra with emphasis on finite structures used in computer science. It includes topics from multi-variate analysis, smooth optimization, and multi-variate integration. The third large topic is computer arithmetics and number representation in a computer along with error manipulation. The last topic includes selected numerical algorithm and their stability analysis. The topics are completed with the demonstration of applications in computer science. The course focuses on clear presentation and argumentation.			
NIE-MPR	Master Project	Z	7
1. At the beginning of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial tasks that should be carried out during the semester. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the end of the semester. 2. The external supervisor enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/student/studijni/formulare). The completed and signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the FT topic that the student has reserved is rather general, the immediate tasks the supervisor assigns to the student for the upcoming semester should aim at fine-tuning the FT topic so that the FTT will be complete and approvable at the end of the semester.			
NIE-MVI	Computational Intelligence Methods	Z,ZK	5
Students will understand the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are parallel in nature and are applicable to solving a wide range of problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Students will learn how these methods work and how to apply them to problems related to data extraction, management, intelligence in games and optimisation, etc.			
NIE-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. This course replaces MIE-MDW.			

NIE-OSY	Operating Systems and Systems Programming	Z,ZK	5
This course is focused on the design and implementation of the basic components that make up modern operating systems. This includes threads, processes, switching context, virtual memory, system calls, interrupts and interactions of SW and HW using drivers. Students will learn the theory of the concept of operating system architecture with emphasis on the kernel architecture. Within the course, they will gain practical experience with the development of a small but fully functional operating system.			
NIE-PAM	Parameterized Algorithms	Z,ZK	4
There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necessary to solve these problems exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one can find a common property (parameter) of the inputs from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponentially in this (small) parameter and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial time preprocessing of the input, which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution method. We will present a plethora of parameterized algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorithm (presumably) does not exist. We will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes.			
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-PDL	Practical Deep Learning	KZ	5
This course is designed to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine learning framework. Throughout the course, students will develop practical skills in building and training deep neural networks, using PyTorch to solve real-world problems in fields such as computer vision and natural language processing.			
NIE-PDP	Parallel and Distributed Programming	Z,ZK	6
21st century in computer architectures is primarily influenced by the shift of the Moore's law into parallelization of CPUs at the level of computing cores. Parallel computing systems are becoming a ubiquitous commodity and parallel programming becomes the basic paradigm of development of efficient applications for these platforms. Students get acquainted with architectures of parallel and distributed computing systems, their models, theory of interconnection networks and collective communication operations, and languages and environments for parallel programming of shared and distributed memory computers. They get acquianted with fundamental parallel algorithms and on selected problems, they will learn the techniques of design of efficient and scalable parallel algorithms and methods of performance evaluation of their implementations. The course includes a semester project of practical programming in OpenMP and MPI for solving a particular nontrivial problem.			
NIE-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-PML	Personalized Machine Learning	Z,ZK	5
Personalized machine learning (PML) is a sub-field of machine learning that aims to create models and predictions based on the unique characteristics and behaviors of individual entities. While PML is commonly used in applications such as recommender systems, which recommend items to users based on their personal interests, its principles can be applied to a wide range of other fields, including education, medicine, and chemical engineering. In this course, we will explore the latest PML methods from theoretical, algorithmic, and practical perspectives. Specifically, we will focus on cutting-edge models that are of interest to both the research and commercial communities.			
NIE-ROZ	Pattern Recognition	Z,ZK	5
The aim of the module is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the statistical approach to pattern recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, and their numerical aspects.			
NIE-SCE1	Computer Engineering Seminar Master I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
NIE-SCE2	Computer Engineering Seminar Master II	Z	4
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NIE-SEP	World Economy and Business	Z,ZK	4
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.			
NIE-SWE	Semantic Web and Knowledge Graphs	Z,ZK	5
The students will learn the most recent concepts and technologies of the Semantic Web. The course will provide an overview of the Semantic Web 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.			
NIE-SYP	Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.			
NIE-TSW	Software Product Development	KZ	4
The course aims to acquaint students with the tools and procedures of project management in the ICT environment. By completing the course, students will master the various methods and techniques of project management and apply them in practice. Students will get acquainted with the issue of creating an IT product, ie. preparation of business model, creation of financial model and creation of project schedule including basic design of architecture and appearance of the given IT product. At the same time, they will try to present the prepared parts of the project to a jury composed of experts from practice. // This course is a continuation of the bachelor's course Project Management.			
NIE-VPR	Research Project	Z	5
Student obtains the credits for published scientific outputs. The details are at https://courses.fit.cvut.cz/NI-VPR/en.			
NIE-VSM	Selected statistical Methods	Z,ZK	7
Summary of probability theory; Multivariate normal distribution; Entropy and its application to coding; Statistical tests: T-tests, goodness of fit tests, independence test; Random processes - stacionarity; Markov chains and limiting properties; Queuing theory			

NIE-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.		

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