Study plan

Name of study plan: Study plan for Ukrainian refugees

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Unspecified Branch/Specialisation of Study

Garantor of the study branch: doc. RNDr. Ing. Marcel Ji ina, Ph.D.

Program of study: Welcome page

Type of study: unknown Required credits: 15 Elective courses credits: 0 Sum of credits in the plan: 15

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 15

The role of the block: P

Code of the group: BIE-PP-UKR

Name of the group: Compulsory bachelor courses for Ukrainian refugees

Requirement credits in the group: In this group you have to gain at least 15 credits (at most 23)

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

Credits in the group: 15 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 |
|---------|---|------------|---------|-------|----------|------|
| UKCJ7 | Czech Language 7 for Ukrainian refugees Zden k Muziká | ZK | 10 | 10C | Z,L | Р |
| UKMAT | Mathematics UK | Z,ZK | 5 | 3P+2C | | Р |
| UKR-PKM | Preparatory Mathematics for Ukrainian refugees Tomáš Kalvoda | Z | 5 | | Z,L | Р |

Characteristics of the courses of this group of Study Plan: Code=BIE-PP-UKR Name=Compulsory bachelor courses for Ukrainian refugees

| UKCJ7 | Czech Language 7 for Ukrainian refugees | ZK | 10 |
|-------------------------|---|------|----|
| Course Czech for foreig | ners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family. | • | |
| UKMAT | Mathematics UK | Z,ZK | 5 |
| UKR-PKM | Preparatory Mathematics for Ukrainian refugees | Z | 5 |
| The purpose of Prepar | atory Mathematics is to help students revise the most important topics of high-school mathematics. | • | |

Name of the block: Elective courses
Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BI-V.2021

Name of the group: Purely Elective Courses of Bachelor Programme BI, Version 2021

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group: Guarantor: prof. lng. Róbert Lórencz, CSc., email: robert.lorencz@fit.cvut.cz

| | -F | | | | _ | |
|----------|---|------------|---------|-------|----------|------|
| 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 |
| BI-ADW.1 | Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |

| BI-ALO | Algebra and Logic Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
|-----------|--|------|---|----------|-----|---|
| BI-AVI.21 | Algorithms visually Lud k Ku era Lud k Ku era Lud k Ku era (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-A2L | English language, preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.) | Z | 2 | 2C | L | V |
| BI-APJ | Aplication Programming in Java Ji i Dan ek | Z,ZK | 4 | 2P+1R+1C | Z | V |
| NI-AFP | Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.) | KZ | 5 | 2P+1C | L | V |
| BIE-ZUM | Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek Pavel Surynek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BI-BLE | Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NI-DSP | Database Systems in Practes Tomáš Vichta Tomáš Vichta (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-STO | Storage and Filesystems | Z,ZK | 4 | 2P+2C | L,Z | V |
| NI-PSD | Public Services Design David Pešek, Ond ej Brém David Pešek David Pešek (Gar.) | KZ | 4 | 1P+2C | | V |
| NI-DZO | Digital Image Processing | Z,ZK | 4 | 2P+1C | L | V |
| NI-DDM | Distributed Data Mining | KZ | 4 | 3C | L | V |
| BI-EP1.24 | Effective programming 1 Martin Ka er | KZ | 4 | 2P+2C | Z | V |
| BI-EP2 | Efficient Programming 2 Martin Ka er Martin Ka er (Gar.) | KZ | 4 | 2P+2C | L | V |
| BI-ANGK | English language, contact preparation for the B2 level exam Kate ina Valentová | Z | 2 | 2C | Z,L | V |
| BI-EJA | Enterprise Java Jií Dan ek Jií Dan ek Jií Dan ek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BI-EJK | Enterprise Java and Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BI-FMU | Financial and Management Accounting David Buchtela David Buchtela (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| BI-HAM | HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš ejka (Gar.) | KZ | 4 | 2P+1C | L | V |
| BI-HMI | History of Mathematics and Informatics Alena Šolcová Alena Šolcová (Gar.) | Z,ZK | 3 | 2P+1C | L | V |
| BI-ARD | Interactive applications on Arduino Ji í Cvr ek, Vojt ch Miškovský, Robert Hülle, Jan ezní ek Robert Hülle Robert Hülle (Gar.) | KZ | 4 | 3C | L | V |
| NI-IAM | Internet and Multimedia | Z,ZK | 4 | 2P+1C | L | V |
| BIE-CSI | Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.) | Z | 2 | 2C | Z | V |
| BIE-IMA2 | Introduction to Mathematics 2 Karel Klouda | Z | 2 | 1C | Z | V |
| BI-CS2 | C# language and data access Pavel Št pán Pavel Št pán Pavel Št pán (Gar.) | KZ | 4 | 0P+3C | Z | V |
| BI-CS3 | Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.) | KZ | 4 | 3C | Z | V |
| BI-SQL.1 | Language SQL, advanced Michal Valenta Michal Valenta (Gar.) | KZ | 4 | 3C | L | V |
| BI-QAP | Quantum algorithms and programming Ivo Petr, Tomáš Kalvoda Ivo Petr Ivo Petr (Gar.) | KZ | 5 | 1P+2C | Z | V |
| NI-LSM | Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.) | KZ | 5 | 3C | L | V |
| BI-HAS | Human Aspects in Cryptography and Security | Z,ZK | 5 | 2P+1C | Z | V |
| NI-MPL | Managerial Psychology Jan Fiala Jan Fiala (Gar.) | ZK | 2 | 2P | Z,L | V |
| NI-MSI | Mathematical Structures in Computer Science Jan Starý Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-MPP.21 | Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| BI-MIT | Mikrotik technologies Jan Fesl Jan Fesl (Gar.) | KZ | 3 | 1P+2C | Z | V |
| NI-MOP | Modern Object-Oriented Programming in Pharo Marek Skotnica, Jan Blizni enko Robert Pergl Robert Pergl (Gar.) | KZ | 4 | 3C | Z | V |
| BI-MVT.21 | Modern Visualisation Technologies Petr Pauš, Ji í Chludil Petr Pauš Petr Pauš (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| BI-MMP | Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.) | KZ | 4 | 3C | Z,L | V |
| BI-ORL | Operations Research and Linear Programming Dušan Knop, Radek Hušek Dušan Knop Dušan Knop (Gar.) | KZ | 5 | 1P+2C | L | V |

| NI-OLI | Linux Drivers | Z,ZK | 4 | 2P+2C | L | V |
|-----------|--|------|---|-------|-----|---|
| BI-ACM | Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.) Programming Practices 1 Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | KZ | 5 | 4C | L | V |
| BI-ACM2 | Programming Practices 2 Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | KZ | 5 | 4C | Z | V |
| BI-ACM3 | Programming Practices 3 Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | KZ | 5 | 4C | L | V |
| BI-ACM4 | Programming Practices 4 | KZ | 5 | 4C | Z | V |
| BI-AND.21 | Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.) Programming for the Android Operating System | KZ | 4 | 3C | L | V |
| BI-CS1 | Jan Mottl, Jan Vep ek, Marek Kodr Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán (Gar.) | KZ | 4 | 3C | L,Z | V |
| BI-PJV | Programming in Java Jan Blizni enko, Miroslav Balík, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) | Z,ZK | 4 | 2P+2C | Z,L | V |
| BI-PJS.1 | JavaScript Programming | KZ | 4 | 3C | L | V |
| BI-KOT | Programing in Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NI-PSL | Programming in Scala Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |
| BI-PMA | Programming in Mathematica | Z,ZK | 4 | 2P+2C | Z | V |
| BI-PHP.1 | Zden k Buk Zden k Buk Zden k Buk (Gar.) Programing in PHP | KZ | 4 | 3C | Z | V |
| BI-PS2 | Programming in shell 2 Lukáš Ba inka | Z,ZK | 4 | 2P+2C | L | V |
| NI-PDD | Data Preprocessing | Z,ZK | 5 | 2P+1C | Z | V |
| BI-PKM | Marcel Ji ina Marcel Ji ina Marcel Ji ina (Gar.) Introduction to mathematics | Z | 4 | | Z | V |
| NI-REV | Tomáš Kalvoda Tomáš Kalvoda (Gar.) Reverse Engineering | Z,ZK | 5 | 1P+2C | Z | V |
| BI-SCE1 | Josef Kokeš, Róbert Lórencz, Ji í Dostál Ji í Dostál Ji í Dostál (Gar.) Computer Engineering Seminar I | Z | 4 | 2C | L,Z | V |
| BI-SCE2 | Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) Computer Engineering Seminar II | Z | 4 | 2C | | - |
| | Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) Network Technology 1 | | | | L,Z | V |
| BI-ST1 | Alexandru Moucha Alexandru Moucha (Gar.) | Z | 3 | 2C | Z | V |
| BI-ST2 | Network Technology 2 Alexandru Moucha Alexandru Moucha (Gar.) | Z | 3 | 3C | L | V |
| BI-ST3 | Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.) | Z | 3 | 2C | Z | V |
| BI-ST4 | Network Technology 4 Alexandru Moucha Alexandru Moucha (Gar.) | Z | 3 | 2C | L | V |
| BI-SKJ.21 | Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.) | Z,ZK | 4 | 2+2 | L | V |
| BI-SOJ | Machine Oriented Languages | 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 |
| BI-GIT | Version control system GIT | KZ | 2 | 16P | Z,L | V |
| BIE-SEG | Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.) | Z | 0 | 2C | Z | V |
| TVV | Physical education | Z | 0 | 0+2 | Z,L | V |
| TV1 | Physical Education | Z | 0 | 0+2 | Z | V |
| TVV0 | Physical education | Z | 0 | 0+2 | Z,L | V |
| TV2 | Physical Education | Z | 0 | 0+2 | L | V |
| TV2K1 | Physical Education 2 | Z | 1 | | L | V |
| TVKLV | Physical Education Course | Z | 0 | 7dní | L | V |
| BI-TS1 | Theoretical Seminar I Dušan Knop, Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | Z | 4 | 2C | Z | V |
| BI-TS2 | Theoretical Seminar II Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.) | Z | 4 | 2C | L | V |
| BI-TS3 | Theoretical Seminar III Tomáš Valla, Ond ej Suchý, Ond ej Guth Tomáš Valla Tomáš Valla (Gar.) | Z | 4 | 2C | Z | V |
| BI-TS4 | Theoretical Seminar IV | Z | 4 | 2C | L | V |
| BI-TDA | Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) Test driven architecture | KZ | 4 | 2P+1C | Z,L | V |
| NI-TSP | Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |

| BI-QUA | Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.) | KZ | 4 | 3C | Z | V |
|-----------|--|------|----|-------|-----|---|
| BI-CCN | Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.) | Z,ZK | 5 | 3P | L | V |
| BI-TEX | TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-KSA | Cultural and Social Anthropology Alena Libánská, Jakub Šenovský, Tomáš Houdek Jakub Šenovský Alena Libánská (Gar.) | ZK | 2 | 2P | Z,L | V |
| BI-ULI | Introduction to Linux Jan Ž árek, Petr Zemánek, Zden k Muziká, Dana ermáková Zden k Muziká Zden k Muziká (Gar.) | Z | 2 | 4D | Z | V |
| BI-OPT | Introduction to Optical Networks Pavel Tvrdík | Z,ZK | 4 | 2P+1C | Z | V |
| NI-VCC | Virtualization and Cloud Computing Jan Fesl, Tomáš Vondra Tomáš Vondra Tomáš Vondra (Gar.) | Z,ZK | 5 | 2P+1C | ┙ | V |
| BI-VHS | Virtual game worlds Radek Richtr Radek Richtr (Gar.) | ZK | 4 | 2P+2C | Z | V |
| BI-VR1 | Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.) | KZ | 4 | 2P+2C | L,Z | V |
| BI-VR2 | Virtual reality II Petr Klán Petr Klán Petr Klán (Gar.) | KZ | 3 | 1P+2C | L | V |
| BI-VAK.21 | Selected Applications of Combinatorics Tomáš Valla Tomáš Valla (Gar.) | Z | 3 | 2R | L | V |
| BI-VMM | Selected Mathematical Methods Tomáš Kalvoda Tomáš Kalvoda (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NI-VYC | Computability Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BI-ZS10 | Bachelor internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 10 | | Z,L | V |
| BI-ZS20 | Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 20 | | Z,L | V |
| BI-ZS30 | Bachelor internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 30 | | Z,L | V |
| BI-ZIVS | Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.) | KZ | 4 | 1P+3C | Z | V |
| BI-ZPI | Process engineering Robert Pergl Robert Pergl Robert Pergl (Gar.) | KZ | 4 | 1P+2C | L | V |
| BI-ZNF | PHP Framework Nette - basics Ji í Chludil | KZ | 3 | 2P+1C | L | V |
| BI-ZRS | Basics of System Control | Z,ZK | 4 | 2P+2C | Z | V |
| BI-IOS | Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.) | KZ | 4 | 2C | Z | V |
| BI-ZWU | Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BI-3DT.1 | 3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.) | KZ | 4 | 3C | L | V |

Characteristics of the courses of this group of Study Plan: Code=BI-V.2021 Name=Purely Elective Courses of Bachelor Programme BI, Version 2021

| DI, VEISION ZUZ I | | | |
|---------------------------|--|--|---------------------|
| BI-ADW.1 | Windows Administration | Z,ZK | 4 |
| This course is presente | d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). | | |
| BI-ALO | Algebra and Logic | Z,ZK | 4 |
| The course extends an | d deepens the study of topics touched upon in the basic course in logic. | | |
| BI-AVI.21 | Algorithms visually | Z,ZK | 4 |
| The course complemen | is other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the compute | r science that ext | end substantially |
| knowledge presented in | BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.o | g <http: td="" www.al<=""><td>govision.org>)</td></http:> | govision.org>) |
| that make understandir | g the principles of algorithms easy. | | |
| BI-A2L | English language, preparation for the B2 level exam | Z | 2 |
| The content of the cour | se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme | nt - students are | due to: -Take an |
| active part in the langua | age instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both | the midterm and | the final term |
| tests with the success r | ate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by | individual teacher | rs during the first |
| class of the term. | | | |
| BI-APJ | Aplication Programming in Java | Z,ZK | 4 |
| This course is presente | d in Czech. Advanced technologies in Java. | | |
| NI-AFP | Applied Functional Programming | KZ | 5 |
| This course is presente | d in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel function | al programming la | anguages are on |
| the rise nowadays and | the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mas | tering this paradio | gm becomes a |
| necessary competence | of a software engineer: the theory and especially the practice. | | |
| BIE-ZUM | Artificial Intelligence Fundamentals | Z,ZK | 4 |
| Students are introduced | to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the clas | sical tasks from t | he areas of state |

space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will

be presented as well.

| BI-BLE | Blender | Z,ZK | 4 |
|---------------------------------------|--|---------------------|--------------------|
| | owledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those mplete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphic | | - ' |
| NI-DSP | Database Systems in Practes | Z,ZK | 4 |
| This course is presente | | Ζ,ΖΙ | |
| BI-STO The student will learn or | Storage and Filesystems inciples and current solutions of storage systems architecture. The module explains principles of data store, protection, and a | Z,ZK | 4 |
| load balancing and high | | Torriving, as so as | storage scaling, |
| NI-PSD | Public Services Design | KZ | 4 |
| | e students to specifics of UX, Service design and development for public sector. We will look into the design and developmer ignesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboratic | - | |
| | lents-designers as well as clients. | | |
| NI-DZO | Digital Image Processing | Z,ZK | 4 |
| · · | comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical a | - | - |
| ·=' | interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is | | |
| | ing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR raction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray c | • | |
| | ossible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac | | |
| NI-DDM | Distributed Data Mining | KZ | 4 |
| | e-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hand | · | • |
| data processing framew | ork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation | s and will be capa | able to propose |
| approaches to paralleliz | e other algorithms. The course is prezented in czech language. | <u> </u> | |
| BI-EP1.24 The course is taught in | Effective programming 1 | KZ | 4 |
| BI-EP2 | Efficient Programming 2 | KZ | 4 |
| | Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indi | · | • |
| | he best one and avoid implementation errors. | | , |
| BI-ANGK | English language, contact preparation for the B2 level exam | Z | 2 |
| The content of the cours | se corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achieveme | nt - students are | due to: -Take an |
| • | ge instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both | | |
| | ate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by i | individual teachers | s during the first |
| class of the term. | Enterprise love | 7 71/ | 4 |
| BI-EJA The course is on advan | Enterprise Java ced technologies in the Java programming language. The focus is on technologies for development of enterprise information | Z,ZK | • |
| | essed through the web interface. | by otomo willon an | |
| BI-EJK | Enterprise Java and Kotlin | Z,ZK | 4 |
| | ced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise inform | | ith microservice |
| architecture, that can be | e deployed to the cloud. | | |
| BI-FMU | Financial and Management Accounting | Z,ZK | 5 |
| | s explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the | | |
| | and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modifica based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manag | | |
| · · · · · · · · · · · · · · · · · · · | based on earlier interiors of adultic entry bookkeeping for enterprising subjects in the ozeen republic. I interpres of maintage oduls in Business information systems. | chiefit decounting | are base or |
| BI-HAM | HW accelerated network traffic monitoring | KZ | 4 |
| This course introduces | students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. T | | |
| network traffic are mand | datory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as | a source of inform | ation and data |
| | of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network to | raffic on a hardwa | re and software |
| <u>'</u> | ir practical abilities in this field. | 7.71/ | |
| BI-HMI This course is presente | History of Mathematics and Informatics | Z,ZK | 3 |
| BI-ARD | Interactive applications on Arduino | KZ | 4 |
| | for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple appli | | |
| , , | eripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded | | |
| not only on display of a | PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore | e is suitable even | for Web and |
| Software Engineering s | | | |
| NI-IAM | Internet and Multimedia | Z,ZK | 4 |
| | cused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes ac als (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practic | - | |
| | ns. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the ϵ | | |
| | of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording | | |
| for audience. | | | |
| BIE-CSI | Introduction to Computer Science | Z | 2 |
| = | lass on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in othe | | |
| . • | idents, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The les of computer science for students to understand, early on, what computer science is, why things such as high-level program | • | |
| | and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer | | |
| | tions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are inte | = | • |
| than expected, or even | less than before. | | |
| BIE-IMA2 | Introduction to Mathematics 2 | Z | 2 |
| | ttend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are | re able to apply th | em in particular |
| examples. | | | |
| | | | |

| BI-CS2 | C# language and data access | KZ | 4 |
|--|--|--|--|
| 1 | lata access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Mic of to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current te | - | |
| , , | and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL | • | |
| and LINQ to SQL). Ano | ther objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data | a using domain-sp | ecific objects |
| ' ' | course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mc | odel, Storage Mod | el and Mapping |
| (XML description). | Language Off design of such applications | 1/7 | 4 |
| BI-CS3 | Language C# - design of web applications oduced to current technologies in web application development on the .NET platform.They will acquire a comprehensive overvi | KZ | 4 |
| | ill learn to create WebAPI and to use it by client programs. | ew of the developi | nent possibilities |
| BI-SQL.1 | Language SQL, advanced | KZ | 4 |
| | wledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In | - | |
| | es, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the po | · · · · · · · · · · · · · · · · · · · | |
| | clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan Ires will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora | - | _ |
| PostgreSQL. | ites will usually discuss our standard, but many leaderes will be demonstrated on ordere bowe. Seminars are based on ore | acie bbivio ana pe | artially on |
| BI-QAP | Quantum algorithms and programming | KZ | 5 |
| Course aims at giving s | tudents hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanic | s, on which quant | um technologies |
| I - | ms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developments and the source of the source | - | |
| - | nowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VN No previous knowledge of physics is assumed. | MM and experienc | e with Python |
| NI-LSM | Statistical Modelling Lab | KZ | 5 |
| _ | on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is | | - |
| available information ar | d its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, | and analyses of t | heir properties. |
| | t is on the border of own research and may result in the topic of final work (diploma or bachelor thesis). | , | |
| BI-HAS | Human Aspects in Cryptography and Security | Z,ZK | . 5 |
| | nts interested not only in technical scope of computer science, but also in making products usable - for users and for develop edge to design, plan and analyse their own projects in the context of human-centered security. | ers. Students of the | nis course can |
| NI-MPL | Managerial Psychology | ZK | 2 |
| NI-MSI | Mathematical Structures in Computer Science | Z,ZK | 4 |
| _ | s of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scot | . , . | • |
| Introduction to category | theory. | | |
| BI-MPP.21 | Methods of interfacing peripheral devices | Z,ZK | 5 |
| | on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on University and paripheral devices side. Labour a practically eriented Students gain experiences with implementation of relevant parts of L | · | • |
| | and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of L on development, and APIs of selected devices. | JSB devices, Lind | x and windows |
| | | | |
| BI-MIT | Mikrotik technologies | KZ | 3 |
| | Mikrotik technologies the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are of | | - |
| The main motivation of middle internet service | the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are opproviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the | commonly used by e metallic, optical | the small and or wireless links |
| The main motivation of middle internet service and how to administrate | the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operating system and some network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computers. | commonly used by e metallic, optical | the small and or wireless links |
| The main motivation of middle internet service and how to administrate and technologies of the | the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operoviders (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computed data-link, network and transport layer of the OSI model. | commonly used by e metallic, optical or er networks conce | the small and or wireless links ots like protocols |
| The main motivation of middle internet service and how to administrate and technologies of the NI-MOP | the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are operating system and some network solutions which are based on the and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computers. | commonly used by metallic, optical or networks conce | the small and or wireless links ots like protocols |
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| BI-CS1 | Programming in C# | KZ | 4 |
|--|--|--|--|
| _ | s to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de | | |
| | properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggi | | • |
| well as work with files ar | e emphasized. | | |
| BI-PJV | Programming in Java | Z,ZK | 4 |
| BI-PJS.1 | I in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). JavaScript Programming | KZ | 4 |
| | is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases developmen | · · · · · · · · · · · · · · · · · · · | • |
| | nts of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for | or this course in th | eir 4th semester |
| of study. | Decrease in a las IZ-Alla | 7.71/ | |
| BI-KOT Kotlin is a modern, static | Programing in Kotlin cally-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adv | Z,ZK vanced language | 4 constructions |
| · · | va compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of | | |
| | late code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages). | | |
| NI-PSL | Programming in Scala | Z,ZK | 4 |
| | ne modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feat . Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks | | _ |
| Scalaz, etc. | | | |
| BI-PMA | Programming in Mathematica | Z,ZK | 4 |
| _ | with modern technical and scientific software. Students will learn how to use different programming styles (functional progra amic interactive applications and visualisations, data processing and presentations. | amming, rule-base | ed programming, |
| BI-PHP.1 | Programing in PHP | KZ | 4 |
| I | Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a | | • |
| · · | e course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register | for BIE-TWA.1. T | ney should |
| | n their 3rd semester of study. | 7.71/ | |
| BI-PS2 | Programming in shell 2 overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add | Z,ZK | deeper insight |
| | overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add or particular scripting languages and will get practical experience with shell script programming. | uition, they gain a | deeper maignt |
| NI-PDD | Data Preprocessing | Z,ZK | 5 |
| | e raw data for further processing and analysis. They learn what algorithms can be used to extract information from various da | | _ |
| time series, etc., and lea pages. | rrn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character | ristics from image | s or from web |
| | Introduction to mathematics | Z | 4 |
| | introduction to matricinatios | | |
| This course is presented | l in Czech. | _ | |
| This course is presented NI-REV | I in Czech. Reverse Engineering | Z,ZK | 5 |
| NI-REV Students will get acquain | Reverse Engineering nted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens | Z,ZK before and after t | he main function |
| NI-REV Students will get acquain is called. Students will un | Reverse Engineering nted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dec | Z,ZK before and after t dicated to reverse | he main function engineering of |
| NI-REV Students will get acquair is called. Students will u applications written in C | Reverse Engineering nted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens | Z,ZK before and after t dicated to reverse edicated to debug | he main function engineering of ggers: how |
| NI-REV Students will get acquain is called. Students will un applications written in C debuggers and debugging the course is on the semi | Reverse Engineering Inted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decentered to the course of the course will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be drown which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computationars, where students will solve practically oriented tasks from the real world. | Z,ZK before and after t dicated to reverse edicated to debug | he main function engineering of ggers: how |
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| NI-REV Students will get acquair is called. Students will ur applications written in C debuggers and debuggin the course is on the sem BI-SCE1 The Seminar of Computer | Reverse Engineering Inted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens in derstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decepted and the students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be drawn and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computationars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance. | Z,ZK before and after t dicated to reverse ledicated to debug er malware scene Z se to failures and a | he main function engineering of ggers: how e. The focus of 4 attacks. Students |
| NI-REV Students will get acquair is called. Students will ur applications written in C debuggers and debuggin the course is on the sem BI-SCE1 The Seminar of Computer are approached individure | Reverse Engineering Inted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is decepted and the standard principles of disassemblers and obfuscation techniques. A part of the course will also be ding work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computationars, where students will solve practically oriented tasks from the real world. Computer Engineering Seminar I | Z,ZK before and after to dicated to reverse ledicated to debuger malware scene Z se to failures and afthe subject is wor | he main function engineering of ggers: how e. The focus of 4 attacks. Students k with scientific |
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| BI-SOJ | Machine Oriented Languages | Z,ZK | 4 |
|----------------------------------|---|------------------------------|-------------------|
| | vill gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optima | | |
| • | n of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view | v linked to higher | level languages. |
| NI-SYP | used during reverse engineering, optimization, and evaluation of code security. | Z,ZK | 5 |
| | Parsing and Compilers the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of | | _ |
| • | stroduced to special applications of parsers, such as incremental and parallel parsing. | . various variante | and applications |
| BI-GIT | Version control system GIT | KZ | 2 |
| | ced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pra | | ırticular system |
| | n details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server | | |
| BIE-SEG | Systems Engineering | Z | 0 |
| | lass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles r and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After takir | | |
| • | be between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what cor | • | |
| parallelism, and how pro | ocesses and threads synchronize efficiently to overcome concurrency for communication. | | |
| TVV | Physical education | Z | 0 |
| TV1 | Physical Education | Z | 0 |
| TVV0 | Physical education | Z | 0 |
| TV2 | Physical Education | Z | 0 |
| TV2K1 | Physical Education 2 | Z | 1 |
| TVKLV | Physical Education Course | Z | 0 |
| BI-TS1 | Theoretical Seminar I | Z | 4 |
| | ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a clas and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is | | • |
| - | e. The capacity is limited by the the potentials of the teachers of the seminar. | a work with solo | nine papers and |
| BI-TS2 | Theoretical Seminar II | Z | 4 |
| Theoretical seminar is in | ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class | sical reading gro | up. The students |
| | and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is | a work with scier | ntific papers and |
| | the capacity is limited by the the potentials of the teachers of the seminar. | 7 | |
| BI-TS3 Theoretical seminar is in | Theoretical Seminar III Intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class | Z sical reading groups: | In The students |
| | and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is | | • |
| | . The capacity is limited by the the potentials of the teachers of the seminar. | | |
| BI-TS4 | Theoretical Seminar IV | Z | 4 |
| | ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class | | • |
| = | and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is s. The capacity is limited by the the potentials of the teachers of the seminar. | a work with sciei | ntific papers and |
| BI-TDA | Test driven architecture | KZ | 4 |
| | n practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a | l l | • |
| | strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in | | |
| | Testing and Reliability | Z,ZK | 5 |
| • | edge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to p | • | |
| • | zation and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with analyze, and control the reliability and availability of the designed circuits. | built-in-self-test e | equipment. They |
| BI-QUA | Quality Assurance | KZ | 4 |
| | students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context | | |
| | perience hands-on application testing using both manual and automated testing. At the end of the semester, the student sho | | |
| analysis, design a set o | test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found | in the product un | der test. |
| BI-CCN | Compiler Construction | Z,ZK | 5 |
| - | lass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme | | students to |
| BI-TEX | TeX and Typography | Z,ZK | 4 |
| | in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the | , , | |
| rules. | γ···································· | | 1) [- 9 [|
| BI-KSA | Cultural and Social Anthropology | ZK | 2 |
| | se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diverse aims to acquaint students. | - | |
| | h from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he | alth, history, deat | h, etc) will be |
| shown. The course is pr | | 7 | 2 |
| BI-ULI Students become famili | Introduction to Linux ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become | Z e familiar with bas | |
| | x-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal). | aa. Will but | |
| BI-OPT | Introduction to Optical Networks | Z,ZK | 4 |
| | view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on pro- | | with deployment |
| • | ology and on their solutions. The course will include the history of optical communications, an overview of passive componen | | |
| | | | |
| the most up-to data ton | s, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sys | , | |
| | s, and otners), and an overview or active components (optical switches and amplifiers, nigh-speed conerent transmission syst cs presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such Insfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters | as the accurate t | ime on Internet, |

| 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 organization | ns. They will get |
| acquainted with virtualization principles, tools and technologies that serve to facilitate and automate co | onfiguration, testing and monitoring, and to efficiently opera | te and optimize the |
| performance parameters of modern computer systems. Theoretically and practically, they will get acqui | | • |
| management of complex computer systems and with specific technologies of cloud systems. Finally, the and development tools (Continuous integration and development). | y will learn the principles and gain practical skills in the use | of modern integration |
| BI-VHS Virtual game worlds | ZK | 4 |
| The course leads students to create a complex virtual world. The course is a continuation of basic graphic | I | vledge is furthermore |
| complemented by the theory of game design, principles of writing dialogues and characters in order to | create a functional and complex virtual world. The course | can be followed by |
| the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environme | nt suitable for VR devices. | |
| BI-VR1 Virtual reality I | KZ | 4 |
| Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another | objective is to meet the rules and requirements of virtual wo | orlds communication. |
| The course focuses on the ways of teaching using virtual reality technologies and interactive activities | in educational virtual 3D worlds. It improves computational | thinking, empathy |
| and shared social activities. | | |
| BI-VR2 Virtual reality II | KZ | 3 |
| Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spa | atial computing and social life of avatars. The objective is to | develop applications |
| for computer science and gamification in various social metaverse and desktop engines. | | 1 |
| BI-VAK.21 Selected Applications of Combinatorics | Z | 3 |
| The course aims to introduce students in an accessible form to various branches of theoretical compute | | |
| issue from applications to theory. Together, we will first refresh the basic knowledge needed to design | · · · · · | |
| with the active participation of students, we will focus on solving popular and easily formulated problem | , | |
| will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic also try to implement solutions to the studied problems with a special focus on the effective use of exis | | iore. Students will |
| | | 1 |
| BI-VMM Selected Mathematical Methods | Z,ZK | 4 |
| We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and an | | |
| Further we deal with differential calculus of functions involving multiple variables. We present methods normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last | | |
| and the Simplex method is analyzed in more detail. | part of the course is devoted to optimization and duality. The | e iiileai programming |
| NI-VYC Computability | Z,ZK | 4 |
| Classical theory of recursive functions and effective computability. | Z,ZR | 4 |
| BI-ZS10 Bachelor internship abroad for 10 credits | Z | 10 |
| Each student can once within his / her bachelor's study programme have a foreign internship at a foreign | I — | 1 |
| internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The | - | |
| internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation | | |
| employment with a foreign institution. The maximum number of credits a student can earn for one interr | | |
| exceeds the academic year's dead-line. | | , |
| BI-ZS20 Bachelor internship abroad for 20 credits | Z | 20 |
| | | |
| Each student can once within his / her bachelor's study programme have a foreign internship at a foreign | I | itution. Before the |
| Each student can once within his / her bachelor's study programme have a foreign internship at a foreign internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The | gn university or other foreign scientific and/or research inst | |
| | gn university or other foreign scientific and/or research inst e student must provide evidence of the professional conten | t and extent of the |
| internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The | gn university or other foreign scientific and/or research inst e student must provide evidence of the professional conten n of the internship in IS KOS. Every 10 credits correspond to | t and extent of the o 4 weeks of full-time |
| internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation | gn university or other foreign scientific and/or research inst e student must provide evidence of the professional conten n of the internship in IS KOS. Every 10 credits correspond to | t and extent of the o 4 weeks of full-time |
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Code of the group: BIE-V.21

Name of the group: Purely Elective Bachelor Courses, Version 2021

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

Guarantor: prof. Ing. Róbert Lórencz, CSc., email: robert.lorencz@fit.cvut.cz

| 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 |
|------------|---|------------|---------|---------|----------|------|
| BIE-ZUM | Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek Pavel Surynek (Gar.) | Z,ZK | 4 | 2P+2C | L | ٧ |
| BIE-ZRS | Basics of Systems Control | Z,ZK | 4 | 2P+2C | L | V |
| BIE-CCN | Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.) | Z,ZK | 5 | 3P | L | V |
| BIE-SCE1 | Computer Engineering Seminar I Miroslav Skrbek, Hana Kubátová Hana Kubátová (Gar.) | Z | 4 | 2C | Z | ٧ |
| BIE-SCE2 | Computer Engineering Seminar II | Z | 4 | 2C | L | V |
| BIE-CZ0 | Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) Czech Language for Foreigners Tomáš Houdek, Markéta Hofmannová, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.) | KZ | 2 | 4C | Z,L | V |
| BIE-CZ1.21 | Czech Language for Foreigners II Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.) | KZ | 2 | 4C | Z,L | V |
| UKCJP | Czech language for advanced Jakub Šenovský, Tomáš Houdek, Jakub Šolc, Adam Vostárek Zden k Muziká Zden k Muziká (Gar.) | Z,ZK | 2 | 2BP+2BC | Z,L | V |
| BIE-EPR | Economic project Tomáš Evan Tomáš Evan (Gar.) | Z | 1 | | L | V |
| BIE-FTR.1 | Financial Markets | Z,ZK | 5 | 2P+2C | L | V |
| BIE-HAS | Human Factors in Cryptography and Security | Z,ZK | 5 | 2P+1C | Z | V |
| BIE-CSI | Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.) | Z | 2 | 2C | Z | ٧ |
| BIE-EHD | Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.) | Z,ZK | 3 | 2P+1C | L | ٧ |
| BIE-IMA | Introduction to Mathematics Karel Klouda | Z | 4 | 3C | Z | ٧ |
| BIE-IMA2 | Introduction to Mathematics 2 Karel Klouda | Z | 2 | 1C | Z | V |
| BIE-ST1 | Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.) | Z | 3 | 2C | Z | V |
| BIE-OOP | Object-Oriented Programming Filip K ikava Filip K ikava (Gar.) | Z,ZK | 4 | 2P+2C | Z | V |
| BIE-PKM | Preparatory Mathematics Jitka Rybní ková Tomáš Kalvoda (Gar.) | Z | 4 | | Z | V |
| BIE-PJV | Programming in Java Jan Blizni enko Jan Blizni enko (Gar.) | Z,ZK | 4 | 2P+2C | Z | ٧ |
| BIE-PS2 | Programming in shell 2 Lukáš Ba inka | Z,ZK | 4 | 2P+2C | L | V |
| BIE-PRR.21 | Project management David Pešek David Pešek David Pešek (Gar.) | Z,ZK | 5 | 2P+2C | Z,L | V |
| BIE-SKJ.21 | Scripting Languages Lukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| BIE-VAK.21 | Selected Combinatorics Applications Dušan Knop, Tomáš Valla, Ond ej Suchý, Šimon Schierreich, Maria Saumell Mendiola Tomáš Valla Tomáš Valla (Gar.) | Z | 3 | 2R | L | V |
| BI-SCE1 | Computer Engineering Seminar I Hana Kubátová Hana Kubátová (Gar.) | Z | 4 | 2C | L,Z | ٧ |
| BIE-SEG | Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.) | Z | 0 | 2C | Z | V |
| TVV | Physical education | Z | 0 | 0+2 | Z,L | V |
| TVV0 | Physical education | Z | 0 | 0+2 | Z,L | V |
| TV2K1 | Physical Education 2 | Z | 1 | | L | V |
| TVKLV | Physical Education Course | Z | 0 | 7dní | L | V |
| BIE-TUR.21 | User Interface Design Jan Schmidt Jan Schmidt (Gar.) | Z,ZK | 5 | 2P+2C | L | V |
| BIE-VR1.21 | Virtual reality I Petr Klán Petr Klán Petr Klán (Gar.) | KZ | 4 | 2P+2C | L,Z | V |

| IE-ADW.1 | Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |
|--|--|--|--|--|--|---|
| IE-SEP | World Economy and Business Tomáš Evan Tomáš Evan (Gar.) | Z,ZK | 4 | 2P+2C | Z | V |
| | · | | | | | |
| | e courses of this group of Study Plan: Code=BIE-V.21 Name=Pur | ely Elective | Bachelo | | | |
| | rtificial Intelligence Fundamentals | | | | ,ZK | 4 |
| udents are introduced to t | the fundamental problems in the Artificial Intelligence, and the basic methods for their solvi | ng. It focuses n | nainly on the | e classical tas | sks from the | e areas of sta |
| ace search, multi-agent s | systems, game theory, planning, and machine learning. Modern soft-computing methods, i | ncluding the ev | olutionary a | algorithms and | d the neura | al networks, w |
| presented as well. | | | | | | |
| E-CSI In | troduction to Computer Science | | | | Z | 2 |
| is is an introductory class | s on Elementary Computer Science for broad audiences: bachelor students in computer sc | ience, students | majoring in | n other fields l | out interest | ted in comput |
| ence, high-school studer | nts, anybody with a background in basic math and the desire to understand the absolute b | asics of compu | uter science | .The goal of | the class is | s to introduce |
| d relate basic principles of | of computer science for students to understand, early on, what computer science is, why t | hings such as l | high-level pr | rogramming I | anguages | and tools are |
| | l even how, on a basic yet representative and practically relevant level. After taking the class | - | | | | |
| estions but also question | ns about themselves such as which courses to take next and which books to follow up with | , ideally realizing | ng if they ar | e interested i | n compute | r science mo |
| an expected, or even less | s than before. | - | - | | • | |
| | troduction to Mathematics 2 | | | | Z | 2 |
| | | homotical princ | sinles and th | ı | _ , | · - |
| | d knowledge of elementary functions and their properties. Students understand basic mat | nematical princ | sipies and ti | iey are able t | о арріу піє | em in particul |
| amples. | | | | | | |
| l l | omputer Engineering Seminar I | | | 1 | Z | 4 |
| · | Engineering is a (s)elective course for students who want to deal with deeper topics of digita | - | - | | | |
| approached individually | y within the subject. Each student or group of students solves some interesting topic with t | he selected su | pervisor. Pa | rt of the subje | ect is work | with scientific |
| icles and other profession | onal literature and/or work in K N laboratories. The capacity of the subject is limited by the | possibilities of | the seminal | r teachers. Th | ne topics ar | re new for ear |
| mester. | | | | | | |
| E-SEG S | ystems Engineering | | | | Z | 0 |
| | s on systems engineering for bachelor students in computer science. The goal of the class | is to introduce | basic princ | ı | _ | ms for studen |
| = | nd memory virtualization. Seeing and actually understanding virtualization is the overarching | | - | - | | |
| • | between processes and threads as well as emulation and virtualization, what virtual memo | • | | • | | |
| | sses and threads synchronize efficiently to overcome concurrency for communication. | ., | | a. 501.5a.151.1 | , .o, ao op | , poodu to |
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BIE-HAS Human Factors in Cryptography and Security This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for developers. Students of this course can use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security. **BIF-FHD** 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. BIE-IMA Introduction to Mathematics Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples. BIE-ST1 Network Technology 1 3 The course is focused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad curriculum, CCNA1 - R&S Introduction to Networks. **BIE-OOP** Object-Oriented Programming Z.ZK Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software development including testing, error handing, refactoring and design patterns. **Preparatory Mathematics** The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics. **BIE-PJV** Z.ZK 4 Programming in Java The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java language the fundamental APIs will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs. Z,ZK BIE-PS2 Programming in shell 2 Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: We are ready do adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice. BIF-PRR.21 Project management 7.7K The aim of the course is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, analysis, crisis management in a project, communication, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk assessment and management, Gantt charts, resource schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for students who are interested in deepening their knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in large companies. The course is also suitable for all those who will develop software or hardware in the form of team projects. Scripting Languages Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: We are ready do adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice. Ζ 3 BIE-VAK.21 **Selected Combinatorics Applications** The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BIE-TUR.21 User Interface Design Z,ZK 5 Students gain a basic overview of methods for designing and testing common user interfaces. They get experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of methods that bring users into the development process to ensure optimal interface for them. BIE-VR1.21 Virtual reality I ΚZ 4 Introduction to Virtual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The course focuses on the ways of creating virtual reality worlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities. Z,ZK Windows Administration Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network. **BIE-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.

Code of the group: NIE-V.21

Name of the group: Purely Elective Master Courses, Version 2021

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

In addition to courses from this group, students can enroll in courses from the group "Elective vocational courses for this specialization". Courses of this group that a student has completed in the bachelor study at CTU cannot be re-completed.

| Code | the bachelor study at CTU cannot be re-complete 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-BLO | Blockchain Róbert Lórencz, Josef Gattermayer, Marek Bielik, Jakub R ži ka Josef Gattermayer Róbert Lórencz (Gar.) | Z,ZK | 5 | 1P+2C | Z | V |
| BIE-CCN | Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.) | Z,ZK | 5 | 3P | L | V |
| NIE-CPX | Complexity Theory Dušan Knop | Z,ZK | 5 | 3P+1C | Z | V |
| NIE-VYC | Computability Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NIE-MVI | Computational Intelligence Methods Pavel Kordík, Miroslav epek Pavel Kordík Pavel Kordík (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NIE-ARI | Computer arithmetic Pavel Kubalík Pavel Kubalík Alois Pluhá ek (Gar.) | Z,ZK | 4 | 2P+1C | Z,L | V |
| NIE-SCE1 | Computer Engineering Seminar Master I Hana Kubátová Hana Kubátová (Gar.) | Z | 4 | 2C | Z | V |
| NIE-SCE2 | Computer Engineering Seminar Master II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) | Z | 4 | 2C | L | V |
| NIE-KOD | Data Compression Jan Holub Jan Holub (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| NI-DSW | Design Sprint Ond ej Brém, Michal Manda Michal Manda David Pešek (Gar.) | Z | 2 | 30B | Z | V |
| NI-DID | Digital drawing Denisa S vová, Eliška Novotná Denisa S vová Denisa S vová (Gar.) | Z | 2 | 4C | Z,L | V |
| NIE-EVY | Efficient Text Pattern Matching Jan Holub Jan Holub (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-GLR | Games and reinforcement learning | Z,ZK | 4 | 2P+2C | L | V |
| NI-GRI | Grid Computing André Sopczak, Petr Fiedler Pavel Tvrdík André Sopczak (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NIE-HMI | History of Mathematics and Informatics Alena Solcová Alena Šolcová (Gar.) | Z,ZK | 3 | 2P+1C | Z | V |
| NIE-DVG | Introduction to Discrete and Computational Geometry Maria Saumell Mendiola Maria Saumell Mendiola (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| MIE-MZI | Mathematics for data science Št pán Starosta | Z,ZK | 4 | 2P+1C | L | V |
| NIE-AM2 | Midleware Architectures 2 Milan Doj inovski Milan Doj inovski (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| NIE-PAM | Parameterized Algorithms Ond ej Suchý | Z,ZK | 4 | 2P+1C | L | V |
| NIE-SYP | Parsing and Compilers Jan Janoušek Jan Janoušek Jan Janoušek (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NIE-ROZ | Pattern Recognition Michal Haindl | Z,ZK | 5 | 2P+1C | Z | V |
| NIE-PML | Personalized Machine Learning Rodrigo Augusto Da Silva Alves Karel Klouda Rodrigo Augusto Da Silva Alves (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-AML | Advanced machine learning Zden k Buk, Miroslav epek, Rodrigo Augusto Da Silva Alves, Petr Šimánek, Vojt ch Rybá Miroslav epek Miroslav epek (Gar.) | Z,ZK | 5 | 2P + 1C | L | V |
| NIE-PDL | Practical Deep Learning Martin Barus, Yauhen Babakhin Karel Klouda Martin Barus (Gar.) | KZ | 5 | 2P+1C | Z | V |
| NIE-VPR | Research Project Št pán Starosta Št pán Starosta Št pán Starosta (Gar.) | Z | 5 | | Z,L | V |
| NIE-SWE | Semantic Web and Knowledge Graphs Milan Doj inovski Milan Doj inovski (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| MI-SCE1 | Computer Engineering Seminar Master I Hana Kubátová | Z | 4 | 2C | L,Z | V |
| NIE-HSC | Side-Channel Analysis in Hardware Vojt ch Miškovský, Petr Socha Vojt ch Miškovský Vojt ch Miškovský (Gar.) | Z,ZK | 4 | 2P+2C | Z | V |
| NIE-DDW | Web Data Mining Milan Doj inovski Milan Doj inovski Milan Doj inovski (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| NIE-BPS | Wireless Computer Networks Alexandru Moucha Alexandru Moucha (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| MIE-SEP | World Economy and Business Tomáš Evan Tomáš Evan (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |

Characteristics of the courses of this group of Study Plan: Code=NIE-V.21 Name=Purely Elective Master Courses, Version 2021

| BIE-CCN | Compiler Construction | Z,ZK | 5 |
|--|--|--|--|
| This is an introductory cl | ass on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle | s of compilers for | students to |
| understand the design a | nd implementation of programming languages. Seeing and actually understanding self-compilation is the overarching them | e of the class. | |
| 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 pla | tforms. They will b | e able to design, |
| code and deploy a secui | re decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course plac | es an increased e | emphasis on the |
| relationship between blo | ckchains and information security. It is concluded with a defense of a research or applied semester project, which prepares | the students for ir | mplementing or |
| supervising implementat | ion of blockchain-based solutions in both academia and business. | | |
| NIE-CPX | Complexity Theory | Z,ZK | 5 |
| | t the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of t | he theory concerr | ning practical |
| (in)tractability of difficult | problems. | | |
| NIE-VYC | Computability | Z,ZK | 4 |
| | sive functions and effective computability. | ' | 1 |
| | Computational Intelligence Methods | Z,ZK | 5 |
| | I the basic methods and techniques of computational intelligence, which are based on traditional artificial intelligence, are page | | - |
| | f problems. The subject is also devoted to modern neural networks and the ways in which they learn and neuroevolution. Stud | | * * |
| | nem to problems related to data extraction, management, intelligence in games and optimisation, etc. | | |
| | Computer arithmetic | Z,ZK | 4 |
| | us data representations used in digital devices and will be able to design arithmetic operations implementation units. | 2,210 | 1 - |
| | Computer Engineering Seminar Master I | Z | 4 |
| | er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistan | _ | 1 |
| • | ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of | | |
| | sional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea | · - | |
| semester. | sional illerature and/or work in K. IN laboratories. The capacity of the subject is infliced by the possibilities of the seminal real | criers. The topics | are new ior each |
| | Computes Engineering Comings Master II | 7 | 1 |
| | Computer Engineering Seminar Master II | Z | 4 |
| · · | er Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistant | | |
| | ally within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of | · - | |
| · | sional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar tea | cners. The topics | are new for each |
| semester. | | | _ |
| | Data Compression | Z,ZK | 5 |
| | to the basic principles of data compression. They will learn the necessary theoretical background and get an overview of data | - | _ |
| · · | erview covers principles of integer coding and of statistical, dictionary, and context data compression methods. In addition, s | students learn the | fundamentals of |
| | methods used in image, audio, and video compression. | | _ |
| | Design Sprint | Z | 2 |
| · · | ojects using the Design Sprint method, developed by Google. THanks to this method the teams are able to go from idea to va | | |
| the course the students | will get familiar with the method as participants. Through practical challenges they will try the whole 5 day process starting w | with research and | finishing with |
| | | | |
| testing the prototypes (p | | 1 | , |
| . , , , , | lus final presentation). Digital drawing | Z | 2 |
| NI-DID The course will introduce | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, p | erspective and co | lor theory, which |
| NI-DID The course will introduce they will practically apply | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, p or in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The cour | erspective and co erspective and co erse is fit for anyor | lor theory, which |
| NI-DID The course will introduce they will practically apply practice or learn drawing | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, p or in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The coug or and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practice gas | erspective and co rse is fit for anyor ained knowledge. | lor theory, which |
| NI-DID The course will introduce they will practically apply practice or learn drawing | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, p or in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The cour | erspective and co erspective and co erse is fit for anyor | lor theory, which |
| NI-DID The course will introduce they will practically apply practice or learn drawing NIE-EVY | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, p or in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The coug or and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practice ga | rerspective and course is fit for anyonained knowledge. | olor theory, which he who wants to |
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| NI-DID The course will introduce they will practically apply practice or learn drawing NIE-EVY Students get knowledge They will be able to use NI-GLR The field of reinforcement | Digital drawing e students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, por in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The course and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practice gas Efficient Text Pattern Matching of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient to the knowledge in design of applications that utilize pattern matching. Games and reinforcement learning | erspective and course is fit for anyoralined knowledge. Z,ZK cocess time and me | olor theory, which he who wants to 5 mory complexity. |
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| NI-DID The course will introduce they will practically apply practice or learn drawing NIE-EVY Students get knowledge They will be able to use NI-GLR The field of reinforcemengive you both theoretical NI-GRI Grid computing and gair NIE-HMI The course focuses on so for finding some relation NIE-DVG The course intends to infort this discipline, and to MIE-MZI In this course, the student include mainly: linear algoselected notions from provided included include | Digital drawing a students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, provin their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The course is organized as a thematic practices covering parts of theory and practical exercise to practice getericient Text Pattern Matching of efficient algorithms for text pattern matching. They learn to use so called succinct data structures that are efficient in both and the knowledge in design of applications that utilize pattern matching. Games and reinforcement learning Interning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligiand practical background so you can participate in related research activities. Presented in English. Grid Computing Interning in the world-wide network and computing infrastructure. History of Mathematics and Informatics selected topics from calculus, general algebra, number theory, numerical mathematics and logic - useful for today computer so between computer science and mathematical methods. Some examples of applications of mathematics to computer scient Introduction to Discrete and Computational Geometry. The main goal of the course is to get familiar be able to solve simple algorithmic problems with a geometric component. Mathematics for data science thas are introduced to the domains of mathematics necessary for understanding the standard methods and algorithms used gebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality principabality theory and statistics. Middleware Architectures 2 rends and technologies on the Web including theoretical foundations. They will gain an overview of Web application architectured and technologies on the Web including theoretical foundations. They will gain an overview of Web application architectured and technologies on the Web including theore | z,ZK science The topic cores will be showe Z,ZK with the most function data science. The cores are concepts at time preprocession method. We were presented in the cores will be showe Z,ZK with the most function data science. The core can find a core concepts at time preprocession method. We were presented in the core can find a core concept at time preprocession method. We were presented in the core can find a | 5 mory complexity. 4 e is intended to 5 as are selected ed. 5 damental notions 4 he studied topics ethods) and 5 and technologies 4 pese problems mmon property small) parameter sing of the input, vill present a s not exist. We |

NIF-ROZ Pattern Recognition 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-PML Personalized Machine Learning Z,ZK 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. NI-AML Advanced machine learning 5 The course introduces students to selected advanced topics of machine learning and artificial intelligence. The topics present techniques in the field of recommendation systems, image processing, control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with the methods discussed. NIE-PDL Practical Deep Learning This course is designed to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine learning 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-VPR Research Project 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. External Master these (MT) supervisor fills his/her assessment into the paper "Form to award assessment by an external Final theses (FT) supervisor" (for the courses BIE-BAP, MIE-MPR, MIE-DIP). Students, then, ensure that the assessment is registered into the information system (IS) by asking their internal FT opponent to award the assessment to the IS based on the confirmation of the external MT supervisor. In the case the FT opponent is external as well, the assessment will be registered to the IS by the head of the department responsible for the topic of the MT. 3. If the FT topic that the student has reserved is rather general, the immediate tasks the supervisor assigns to the student 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-SWE Semantic Web and Knowledge Graphs 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. MI-SCE1 Computer Engineering Seminar Master I Z The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. NIE-HSC Side-Channel Analysis in Hardware 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. Web Data Mining Students will learn latest methods and technologies for web data acquisition, analysis and utilization of the discovered knowledge. Students will gain an overview of Web mining techniques for Web crawling, Web structure analysis, Web usage analysis, Web content mining and information extraction. Students will also gain an overview of most recent developments in the field of social web and recommendation systems. **NIE-BPS** Wireless Computer Networks Z.ZK 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. MIE-SEP World Economy and Business 7.7K 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. Code of the group: NI-V.2021 Name of the group: Purely Elective Master Courses, Version 2021

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

In addition to the courses listed here, you can enroll as an elective any course that is offered within your study program and form of study that you did not enroll as a compulsory subject in the program/branch/specialization or a compulsory elective course. Courses of this group that a student has completed in the bachelor study at CTU cannot be re-completed.

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Completion Credits Code Scope Semester Role members) Tutors, authors and guarantors (gar.) AlgorithmicTheories of Games NI-ATH 2P+2C L Z,ZK 4 ٧ Dušan Knop, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.) Algorithms and Graphs 2 BI-AG2.21 5 L Z,ZK 2P+2C Radek Hušek, Ond ej Suchý, Michal Opler Ond ej Suchý Ond ej Suchý (Gar.)

| NI-AFP | Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.) | KZ | 5 | 2P+1C | L | ٧ |
|-----------|---|------|---|------------|---------|---|
| NI-APH | Architecture of computer games Adam Vesecký Adam Vesecký Adam Vesecký (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |
| BI-APS.21 | Architectures of Computer Systems Pavel Tvrdík, Michal Štepanovský Michal Štepanovský Pavel Tvrdík (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| NI-BPS | Wireless Computer Networks Alexandru Moucha Alexandru Moucha (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-BEK.21 | Secure Code Josef Kokeš, Viktor Fischer Róbert Lórencz Josef Kokeš (Gar.) | Z,ZK | 5 | 2P+2C | L | V |
| BI-BLE | Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NIE-BLO | Blockchain Róbert Lórencz, Josef Gattermayer, Marek Bielik, Jakub R ži ka Josef Gattermayer Róbert Lórencz (Gar.) | Z,ZK | 5 | 1P+2C | Z | V |
| NI-CTF | Capture The Flag Ji i Dostál | KZ | 4 | 3C | Z | V |
| NI-DPH | Game Design Adam Vesecký Adam Vesecký (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| NI-DSW | Design Sprint Ond ej Brém, Michal Manda Michal Manda David Pešek (Gar.) | Z | 2 | 30B | Z | V |
| NI-PSD | Public Services Design David Pešek, Ond ej Brém David Pešek David Pešek (Gar.) | KZ | 4 | 1P+2C | | V |
| NI-DID | Digital drawing Denisa S vová, Eliška Novotná Denisa S vová Denisa S vová (Gar.) | Z | 2 | 4C | Z,L | V |
| NI-DZO | Digital Image Processing | Z,ZK | 4 | 2P+1C | L | V |
| NI-DDM | Distributed Data Mining | KZ | 4 | 3C | L | V |
| NI-PAM | Efficient Preprocessing and Parameterized Algorithms Ond ej Suchý Ond ej Suchý Ond ej Suchý (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-EHA.21 | Ethical Hacking Ji í Dostál, Tomáš Kiezler, Martin Kolárik, Martin Šutovský Ji í Dostál Ji í Dostál (Gar.) | Z,ZK | 5 | 2P+2C | L | V |
| NI-ESC | Experimental Project Course Ond ej Brém, Jitka Aslan, Jan Matoušek Ond ej Brém Ond ej Brém (Gar.) | KZ | 8 | 0P430R452C | L | V |
| BI-FMU | Financial and Management Accounting David Buchtela David Buchtela (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| BI-FTR.1 | Financial Markets | Z,ZK | 5 | 2P+2C | L | V |
| NI-GLR | Games and reinforcement learning | Z,ZK | 4 | 2P+2C | L | V |
| NI-GNN | Graph Neural Networks Miroslav epek Miroslav epek (Gar.) | Z,ZK | 4 | 1P+1C | L | V |
| NI-GRI | Grid Computing André Sopczak, Petr Fiedler Pavel Tvrdík André Sopczak (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-HCM | Mind Hacking Marcel Ji ina, Josef Holý Marcel Ji ina Marcel Ji ina (Gar.) | ZK | 5 | 2P+1C | Z | V |
| NI-HSC | Side-Channel Analysis in Hardware Vojt ch Miškovský, Petr Socha Petr Socha Vojt ch Miškovský (Gar.) | Z,ZK | 4 | 2P+2C | Z | V |
| NI-HMI2 | History of Mathematics and Informatics Alena Šolcová Alena Šolcová (Gar.) | ZK | 3 | 2P+1C | Z | V |
| NI-IBE | Information Security | ZK | 2 | 2P | Z | V |
| NI-IVS | Intelligent embedded systems Miroslav Skrbek Miroslav Skrbek (Gar.) | KZ | 4 | 1P+3C | L | V |
| NI-IKM | Internet and Classification Methods Martin Hole a Martin Hole a (Gar.) | Z,ZK | 4 | 1P+1C | L | V |
| NI-IAM | Internet and Multimedia | Z,ZK | 4 | 2P+1C | L | V |
| NI-IOT | Internet of Things Jan Jane ek Jan Jane ek (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| BI-JPO.21 | Computer Units Pavel Kubalík Pavel Kubalík (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| NI-KTH | Combinatorial Theories of Games Tomáš Valla Tomáš Valla (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| NI-FMT | Finite model theory Tomáš Jakl Tomáš Jakl (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| NI-CCC | Creative Coding and Computational Art Radek Richtr, Josef Kortán Radek Richtr Radek Richtr (Gar.) | KZ | 4 | 1P+2C | Z,L | V |
| NI-KYB | Cybernality | ZK | 5 | 2P | Z | V |
| NI-LSM2 | Statistical Modelling Lab | KZ | 5 | 3C | Z,L | V |
| NI-LOM | Kamil Dedecius Kamil Dedecius Kamil Dedecius (Gar.) Linear Optimization and Methods | Z,ZK | 5 | 2P+1C | | V |
| | Dušan Knop Dušan Knop Dušan Knop (Gar.) Managerial Psychology | | | | | |
| NI-MPL | Jan Fiala Jan Fiala (Gar.) | ZK | 2 | 2P | Z,L | V |

| NI-MSI | Mathematical Structures in Computer Science Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
|-----------|---|------|---|---------|-----|---|
| NI-MZI | Mathematics for data science St pán Starosta | Z,ZK | 4 | 2P+1C | L | V |
| BI-MPP.21 | Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| NI-MOP | Modern Object-Oriented Programming in Pharo Marek Skotnica, Jan Blizni enko Robert Pergl Robert Pergl (Gar.) | KZ | 4 | 3C | Z | V |
| NI-NMU | New media in art and design Zden k Svejkovský Zden k Svejkovský (Gar.) | ZK | 3 | 2P+0C | Z | V |
| NI-OLI | Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NIE-PML | Personalized Machine Learning Rodrigo Augusto Da Silva Alves Karel Klouda Rodrigo Augusto Da Silva Alves (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-ARI | Computer arithmetic Pavel Kubalik Pavel Kubalik (Gar.) | Z,ZK | 4 | 2P+1C | Z,L | V |
| NI-PG1 | Computer Grafics 1 Radek Richtr Radek Richtr (Gar.) | ZK | 4 | 2P+1C | L | V |
| NI-EDW | Enterprise Data Warehouse Systems Jakub Krej í, Robert Kotlá Jakub Krej í Magda Friedjungová (Gar.) | Z,ZK | 5 | 1P+1C | L | V |
| NI-PVR | Advanced Virtual Reality Petr Pauš Petr Pauš Petr Pauš (Gar.) | KZ | 4 | 2P+1C | Z | V |
| NI-AML | Advanced machine learning Zden k Buk, Miroslav epek, Rodrigo Augusto Da Silva Alves, Petr Šimánek, Vojt ch Rybá Miroslav epek Miroslav epek (Gar.) | Z,ZK | 5 | 2P + 1C | L | V |
| NI-IOS | Advanced techniques in iOS applications Rostislav Babá ek, Igor Rosocha, Jakub Olejník Martin P Ipitel Martin P Ipitel (Gar.) | KZ | 4 | 2P+2C | L | V |
| NI-APT | Advanced Program Testing Pierre Donat-Bouillud Pierre Donat-Bouillud (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-PVS | Advanced embedded systems Miroslav Skrbek | Z,ZK | 4 | 2P+2C | Z | V |
| NI-DNP | Advanced .NET Nikolas Jíša Nikolas Jíša Nikolas Jíša (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |
| NI-PYT | Advanced Python Miroslav Hron ok | KZ | 4 | 3C | Z | V |
| NIE-PDL | Practical Deep Learning Martin Barus, Yauhen Babakhin Karel Klouda Martin Barus (Gar.) | KZ | 5 | 2P+1C | Z | V |
| BI-PJP.21 | Programming Languages and Compilers Jan Janoušek, Št pán Plachý, Tomáš Pecka Jan Janoušek (Gar.) | Z,ZK | 5 | 2P+1C | L | ٧ |
| NI-PSL | Programming in Scala Ji í Dan ek Ji í Dan ek (Gar.) | Z,ZK | 4 | 2P+1C | Z | V |
| BI-PMA | Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) | Z,ZK | 4 | 2P+2C | Z | V |
| NI-RUB | Programming in Ruby Cyril erný Cyril erný (Gar.) | KZ | 4 | 3C | Z | V |
| NI-ROZ | Pattern Recognition Radek Richtt, Michal Haindl Michal Haindl (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| NI-SCE1 | Computer Engineering Seminar Master I Hana Kubátová Miroslav Skrbek Hana Kubátová (Gar.) | Z | 4 | 2C | L,Z | V |
| NI-SCE2 | Computer Engineering Seminar Master II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.) | Z | 4 | 2C | L,Z | V |
| NI-SZ1 | Knowledge Engineering Seminar Master I Pavel Kordík Magda Friedjungová (Gar.) | Z | 4 | 2C | L,Z | V |
| NI-SZ2 | Knowledge Engineering Seminar Master II Pavel Kordík Magda Friedjungová (Gar.) | Z | 4 | 2C | L,Z | V |
| PI-SCN | Seminars on Digital Design Petr Fiser Petr Fiser Petr Fiser (Gar.) | ZK | 4 | 2P+1C | Z,L | V |
| BI-SOJ | Machine Oriented Languages | Z,ZK | 4 | 2P+2C | L | V |
| NI-MLP | Machine Learning in Practice Jan Hu in Daniel Vašata Jan Hu in (Gar.) | Z,ZK | 5 | 2P+1C | Z | V |
| BI-SVZ.21 | Machine vision and image processing Marcel Ji ina, Lukáš Brchl, Jakub Novák Jakub Novák Marcel Ji ina (Gar.) | Z,ZK | 5 | 2P+2C | L,Z | V |
| NI-SEP | World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.) | Z,ZK | 4 | 2P+1C | Z,L | V |
| BI-SRC.21 | Real-time systems Hana Kubátová Jaroslav Borecký Hana Kubátová (Gar.) | Z,ZK | 5 | 2P+2C | Z | V |
| NI-TVR | Virtual Reality Technology Tomáš Nová ek Tomáš Nová ek (Gar.) | Z,ZK | 3 | 1P+1C | L,Z | V |
| NI-TS1 | Theoretical Seminar Master I Dušan Knop, Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | Z | 4 | 2C | Z | V |
| NI-TS2 | Theoretical Seminar Master II Tomáš Valla, Ond ej Suchý Tomáš Valla Tomáš Valla (Gar.) | Z | 4 | 2C | L | V |

| | | | 1 | | | |
|-----------|--|------|----|-------|-----|---|
| NI-TS3 | Theoretical Seminar Master III Tomáš Valla, Ond ej Suchý, Ond ej Guth Tomáš Valla Tomáš Valla (Gar.) | Z | 4 | 2C | Z | V |
| NI-TS4 | Theoretical Seminar Master IV Tomáš Valla, Ond ej Suchý Tomáš Valla Ond ej Suchý (Gar.) | Z | 4 | 2C | L | V |
| NI-TKA | Category Theory Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+1C | L | V |
| NI-TNN | Theory of Neural Networks Martin Hole a Martin Hole a Martin Hole a (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| NI-CPX | Complexity Theory Dušan Knop, Ond ej Suchý Ond ej Suchý (Gar.) | Z,ZK | 5 | 3P+1C | Z | V |
| BI-CCN | Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.) | Z,ZK | 5 | 3P | L | V |
| NI-DVG | Introduction to Discrete and Computational Geometry Maria Saumell Mendiola Maria Saumell Mendiola (Gar.) | Z,ZK | 5 | 2P+1C | L | ٧ |
| BI-VHS.21 | Virtual game worlds Radek Richtr Radek Richtr (Gar.) | Z,ZK | 5 | 2P+2C | Z | ٧ |
| NI-VOL | Elections Dušan Knop Dušan Knop (Gar.) | Z,ZK | 5 | 2P+1C | L | V |
| BI-VMM | Selected Mathematical Methods Tomáš Kalvoda Tomáš Kalvoda (Gar.) | Z,ZK | 4 | 2P+2C | L | ٧ |
| NI-VYC | Computability Jan Starý Jan Starý (Gar.) | Z,ZK | 4 | 2P+2C | L | V |
| NI-VPR | Research Project Št pán Starosta Št pán Starosta Št pán Starosta (Gar.) | Z | 5 | | Z,L | V |
| NI-ZS10 | Master internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 10 | | Z,L | V |
| NI-ZS20 | Master internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 20 | | Z,L | V |
| NI-ZS30 | Master internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 30 | | Z,L | V |

| NI-ZS10 | Zden k Muziká Zden k Muziká (Gar.) | Z | 10 | Z,L | V |
|------------------------------|---|------------------------------|-----------------------|------------------------|----------------|
| NI-ZS20 | Master internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 20 | Z,L | V |
| NI-ZS30 | Master internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.) | Z | 30 | Z,L | V |
| | he courses of this group of Study Plan: Code=NI-V.2021 N | ame=Purely Electi | ve Master Co | ourses, Version | 2021 |
| NI-AFP | Applied Functional Programming | | | KZ | 5 |
| This course is presented | in Czech. Functional programming represents one of the traditional programming | g paradigms. Traditional a | nd novel function | nal programming lang | guages are o |
| the rise nowadays and the | e functional paradigm becomes an important construct of traditionally imperative | languages (C++, C#, Ja | va). As such, mas | stering this paradigm | becomes a |
| necessary competence of | f a software engineer: the theory and especially the practice. | | | | |
| BI-BLE I | Blender | | | Z,ZK | 4 |
| The course extends know | rledge of opensource program Blender from BI-MGA (Multimedia and Graphics A | Applications) course. It is | intended for thos | e interested in 3D gr | aphics and |
| animation. It offers a com | plete and practically oriented introduction to Blender environment. Students may | continue to BI-PGA (Pro | gramming graphi | ics applications) cour | rse. |
| NI-PSD I | Public Services Design | | | KZ | 4 |
| The course will introduce | students to specifics of UX, Service design and development for public sector. W | Ve will look into the design | n and developme | nt process from the | perspective of |
| suppliers (devs and desig | nesr) as well as clients. In small teams students will work on projects from partn | er organizations and will | try out collaborat | ion with client repres | entatives. |
| Course is aimed at stude | nts-designers as well as clients. | | | | |
| NI-DZO I | Digital Image Processing | | | Z,ZK | 4 |
| This course presents a co | omprehensive overview of modern methods for interactive editing of digital image | es and video. It mainly de | als with practical | algorithms that are b | ooth easy to |
| implement and have an in | teresting theoretical basis. Visually attractive applications provide better understa | nding of basic theoretical | background that | is also valuable outsi | de the domai |
| of digital image processing | g. This course will introduce algorithms solving the following practical application | ns: edge-aware editing, to | ne mapping, HDI | R compression, de-b | lurring in |
| frequency domain, abstra | ction, hybrid images, gradient domain editing, seamless image stitching and clor | ning, digital photo-montag | ge, color-to-gray | conversion, context e | enhancemen |
| interactive as-rigid-as-pos | ssible image deformation, free-form image registration, texture synthesis, interac- | tive segmentation, coloriz | zation, painting, a | idding depth, alpha n | natting. |
| NI-DDM I | Distributed Data Mining | | | KZ | 4 |
| Course focuses on state- | of-the-art approaches for distributed data mining and parallelization of machine I | earning algorithms. Stude | ents will gain han | ds on experience wit | th large scale |
| data processing framewo | rk Apache Spark and with existing distributed DM / ML algorithms. They will learn | n principles of their parall | el implementation | ns and will be capabl | e to propose |
| approaches to parallelize | other algorithms. The course is prezented in czech language. | | | | |
| BI-FMU I | Financial and Management Accounting | | | Z,ZK | 5 |
| The aim of the course is | explanation of basic terms in the theory of accounting, the principles of balancing | the property amounts a | nd liabilities in the | e particular accountir | ng operations |
| operations in accounts ar | nd accounting statements including opening and closing of bookkeeping. The cou | urse provides students wi | th a legal modific | ation of bookkeeping | g, description |
| of economic operations b | ased on current methods of double-entry bookkeeping for enterprising subjects i | in the Czech Republic. Pr | inciples of manag | gement accounting a | re base of |
| Business Inteligence mod | duls in Business information systems. | | | | |
| NI-IAM I | Internet and Multimedia | | | Z,ZK | 4 |
| | used on principles and modern technologies for network transmissions of audiov | isual (AV) signals. The sy | rllabus includes a | 1 ' 1 | als (input), |
| | s (output), network communication protocols, device interfaces, codecs, data form | , , , | | | |
| | s. Within the labs, students will practically assemble AV transmission chains using | | | | |
| the quality and latency of | AV transmissions. Students will learn how to build Internet infrastructure for end- | to-end AV transmissions | from the recordin | g the scene up to the | e presentatio |
| for audience. | | | | | |
| NI-MPL I | Managerial Psychology | | | ZK | 2 |
| | Mathematical Structures in Computer Science | | | Z,ZK | 4 |
| | of programming languages. Data types as continous lattices, Scott topology. Programming languages. | cedures as continuous m | appings The Sco | 1 ' 1 | • |
| Introduction to category the | | ssaaroo do continuodo III | | | a.ouiuo. |
| | | | | Z.ZK | 5 |
| | Methods of interfacing peripheral devices | na la facusad en tach-l | aa baaad aa U-: | _, | • |
| | methods for interfacing of peripheral devices. Interfacing of real peripheral devices of peripheral devices side. Labs are practically oriented. Students gain experience | · | | • | • |

includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows

drivers, simple application development, and APIs of selected devices.

| NI-MOP Modern Object-Oriented Programming in Pharo | KZ | 4 |
|--|--|---|
| Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, visused to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the | = | |
| of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their developm | • | • |
| addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to | | |
| technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct inv | | ro Consortium. |
| NI-OLI Linux Drivers | Z,ZK | 4 |
| The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combir increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver develop | | |
| course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experier | | ducino. Tric |
| NI-PSL Programming in Scala | Z,ZK | 4 |
| The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language for the course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language for the course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language for the course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language for the course introduces the modern programming language Scala which exploits object-functional paradigm. | | _ |
| advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful framework Scalaz, etc. | ks and libraries e.g. | Play, Cassandra, |
| BI-PMA Programming in Mathematica | Z,ZK | 4 |
| Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional pro | | · · |
| etc.), how to create dynamic interactive applications and visualisations, data processing and presentations. | | |
| BI-SOJ Machine Oriented Languages | Z,ZK | 4 |
| Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on opti and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of | • | |
| This knowledge will be used during reverse engineering, optimization, and evaluation of code security. | new inflict to riigher | lever lariguages. |
| BI-CCN Compiler Construction | Z,ZK | 5 |
| This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principal construction for bachelor students in computer science. | • | students to |
| understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching the | | г |
| BI-VMM Selected Mathematical Methods We start surjection separation of linear product. Next, we introduce and english the dispose Fourier transform (PET). | Z,ZK | 4 |
| We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of fur | | |
| normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization | | |
| and the Simplex method is analyzed in more detail. | | |
| NI-VYC Computability | Z,ZK | 4 |
| Classical theory of recursive functions and effective computability. 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 programming. | | _ |
| code and deploy a secure decentralized application, and assess whether integration of a blockchain is suitable for a given problem. The course pl | | - |
| relationship between blockchains and information security. It is concluded with a defense of a research or applied semester project, which prepare | es the students for in | nplementing or |
| supervising implementation of blockchain-based solutions in both academia and business. | | |
| NI-DSW Design Sprint Students will work on projects using the Design Sprint method, developed by Google. THanks to this method the teams are able to go from idea to | Z | in 5 days During |
| the course the students will get familiar with the method as participants. Through practical challenges they will try the whole 5 day process starting | validated prototype | |
| the course the students will get familial with the method as participants. Through practical challenges they will try the whole 5 day process starting | with research and | finishing with |
| testing the prototypes (plus final presentation). | g with research and | finishing with |
| testing the prototypes (plus final presentation). NI-DID Digital drawing | | 2 |
| testing the prototypes (plus final presentation). NI-DID Digital drawing The course will introduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition | Z perspective and co | 2 lor theory, which |
| testing the prototypes (plus final presentation). NI-DID Digital drawing The course will introduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition they will practically apply in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The contraction of the prototypes (plus final presentation). | Z perspective and co | 2 lor theory, which |
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| NI-APH | Architecture of computer games | Z,ZK | 4 |
|---------------------------------------|--|----------------------|--------------------|
| - | c understanding of the various issues in the field of computer games development, especially from a technical point of view, but | = | |
| | et a grasp of component-oriented and functional-oriented architecture, game mechanics, decision-making processes and base | | - 1 |
| - | ey will also understand the basics of pathfinding, networking and scripting and apply them in practical exercises (labs). An im ople game, with a strong focus on nontrivial game mechanics. | portant part of the | course is all |
| BI-APS.21 | Architectures of Computer Systems | Z,ZK | 5 |
| | construction principles of internal architecture of computers with universal processors at the level of machine instructions. Specifically, the contraction of the co | | - |
| pipelined instruction pro | cessing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the p | orinciples of instru | ction processing |
| | ssors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness | • | |
| · - | ther elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory of | oherence and con | sistency in such |
| systems. | Marile O - maritan Nationalis | 7.71/ | 4 |
| NI-BPS | Wireless Computer Networks It the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in | Z,ZK | 4 multicast and |
| | it the modern technologies, protocols, and standards for wheless networks. They will understand the routing mechanisms in a new data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get kno | | |
| | nd get skills of configuration of wireless network elements and simulation of wireless networks using suitable tools. | wicage or security | mechanisms |
| BI-BEK.21 | Secure Code | Z,ZK | 5 |
| | now to assess security risks and how to take them into account in the design phase of their own code and solutions. After gettir | | |
| | actical experience with running programs with reduced privileges and methods of specifying these privileges, since not every | | |
| • • | Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securin | - | |
| | systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the | | |
| NI-CTF | Capture The Flag | KZ | 4 |
| | to introduce students to CTF competitions and let them gain practical experience in the field of cyber security. | 7 71/ | |
| NI-DPH | Game Design ts the NI-APH (Architecture of Computer Games) and BI-VHS (Virtual gaming worlds) course, while focusing primarily on gar | Z,ZK | 5 |
| · · | by ledge of the principles used for games design, such as: level design, gameplay design, character design, game mechanics | _ | |
| - | students will get an overview of game development from the designer's perspective, from theoretical concepts to practical im | | |
| projects. | | | |
| NI-PAM | Efficient Preprocessing and Parameterized Algorithms | Z,ZK | 4 |
| There are many optimiz | ation problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often nece | ssary to solve the | se problems |
| - · | vill demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often | | |
| | s from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity experience of the complexity | - | |
| | input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomia the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solut | | |
| · · | and classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution and algorithm (and parameter) such an algorithm (| | · · |
| | e relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes. | p. 000as.y, a000 | |
| BI-EHA.21 | Ethical Hacking | Z,ZK | 5 |
| The goal of the course i | s to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vu | | heir possible |
| exploitation in computer | networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus | is on hands-on e | xperience with |
| | nd the following process of penetration test documentation. | | |
| NI-ESC | Experimental Project Course | KZ | 8 |
| | urse offers a holistic exploration of the design process, providing students with a well-rounded understanding of the principles | - | |
| | -driven solutions that are user-centric and industry-relevant. Throughout the semester, students will work on real-world design egrate theory with practical application. Through a hands-on, project-based learning approach, students will develop their sk | | - 1 |
| | tion, as well as gain experience working in a team to design and prototype a functional solution." | | ou doolgii und |
| BI-FTR.1 | Financial Markets | Z,ZK | 5 |
| | d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). | , —,— , | _ |
| NI-GNN | Graph Neural Networks | Z,ZK | 4 |
| The course introduces s | students to advanced artificial intelligence techniques for working with graphs. Lectures will focus on the latest graph neural r | networks for creati | ng vector |
| • | s, edges and entire graphs. The techniques discussed cover various types of graphs, including time-varying graphs. The last | part of the course | e also covers |
| | terpretability of graph neural networks. In the exercises, students will try out selected techniques and problems. | | |
| NI-HCM | Mind Hacking | ZK | 5 |
| • | emerging discipline that is closely related to cyber security. While the domain of cyber security is the protection of networks, | • | · |
| - | security is the protection of the human mind from intentional and unintentional digital manipulation. The topic of cognitive sec n warfare, increasing digital dependence and the development of artificial intelligence, where these phenomena from the Inter | | • |
| | ion of social cohesion, threats to democracy or war. | | |
| NI-HSC | Side-Channel Analysis in Hardware | Z,ZK | 4 |
| | d to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical atta | | |
| various kinds of side ch | annels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks ar | nd get familiar with | n higher-order |
| | ractice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel inform | | |
| NI-HMI2 | History of Mathematics and Informatics | ZK | 3 |
| • | d in Czech. Selected topics {Infinitesimal calculus, probability, number theory, general algebra, different examples of algorithm | ns, transformation | ns, recursive |
| · · · · · · · · · · · · · · · · · · · | , etc.) note on possibilities of applications of some mathematical methods in informatics and its development. | 71/ | 0 |
| NI-IBE | Information Security | ZK | 2 |
| | ion and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internat management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g., pen | | uno area. Hiey |
| NI-IVS | Intelligent embedded systems | KZ | 4 |
| | riteringerit embedued systems estems course for master's degree is focused on high-level technology embedded systems integrating artificial intelligence. The | | |
| - | ded system fundamentals course for the bachelor degree. The aim of the course is to teach students humanoid robot progra | | |
| development. Lectures p | provide basis of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students | nts develop advan | ced applications |
| combining knowledge o | f various courses like nature inspired algorithms, data mining algorithms, image recognition and web technologies | | |
| | | | |
| | | | |

| NI-IKM | Internet and Classification Methods | Z,ZK | 4 |
|---|--|---|--------------------------------------|
| | nts get acquainted with classification methods used in four important internet, or generally network applications: in spam filte | - | |
| • | stems and in intrusion detection systems. However, they will learn more than only how classification is performed when solvi | • | |
| - | ese applications, they get an overview of the fundamentals of classification methods. The course is taught in a 2-weeks cycl ercises, the students on the one hand implement simple examples to topics from the lectures, on the other hand consult thei | | ires and 2-nour |
| | | | |
| NI-IOT | Internet of Things on the area of hardware and software technologies for the strongly growing computer support of various devices. Its goal is fa | Z,ZK | 4 |
| | Raspberry Pi, Arduino Due) and with the language for efficient application development and modification (GNU Forth). | annianzation with a | avaliable |
| BI-JPO.21 | Computer Units | Z,ZK | 5 |
| | asic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detai | | |
| • | r units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using app | | |
| - | panization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, inclu | • | |
| correction for parallel an | d serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of cor | mmunication of the | e processor with |
| the environment and the | architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micro | oprogrammed proc | cessor simulator |
| and programmable hard | ware design kits (FPGA). | | |
| NI-KTH | Combinatorial Theories of Games | Z,ZK | 4 |
| | is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory st | | - |
| | mpetitive process by designinng a mathematical model and investigating the strategies. The traditional task of classical game | - | |
| | ne game where no player wants to deviate from his strategy. Historically, the second big development in game theory of two-pl | • | |
| | Berlekamp and Guy. They developed a theory, originally used for solving end-games in Go, into a full fledged field. The idea | _ | |
| - | games can be added, that is, played simultaneously. This led to the algrebraic approach to study combinatorial games. The the standard that the standard the standa | - | |
| | blished the theory of positional games (like tic-tac-toe and hex). In analysis of these game, one cannot escape the brute-force Educed the "false probabilistic method", which aims to tackhle this problem. In this course we build the foundation of the theo | _ | |
| | oretical analysis of games and building the theory, not on the programming aspects of game solving algorithms. The course | = | • |
| = | se, think and proof. The course is also suitable for bachelors student in the third year, who attended introduction to graph the | | - 1 |
| looking for research topi | | ,, | |
| NI-FMT | Finite model theory | Z,ZK | 4 |
| , | to introduce students to the basics of finite model theory. The original motivation is the questions expressibility and verifiability | | - |
| | tion in the 1970s, the course has evolved rapidly and touched on many other areas of theoretical computer science, such as | | |
| Constraint Satisfaction F | Problem (CSP), the theory of algorithmic meta-theorems and combinatorics. | | |
| NI-CCC | Creative Coding and Computational Art | KZ | 4 |
| Students work on practic | cal tasks, get acquainted with creative and yet proven methods of visualizing various types of data. The course freely follows | the basic graphics | courses (MGA, |
| \ensuremath{BLE},\ldots) and introduces | students to suitable visualization methods for traditional as well as for open data. It combines well-known visualization techn | iques with artistic r | methods using |
| _ | ne aim is to create an interesting visualization project. It is planned to work closely with IPR CAMP (Center of Architecture ar | nd Metropolitan Pla | anning) and IIM |
| (Institute of Intermedia F | FEL). | | |
| NI-KYB | Cybernality | ZK | 5 |
| | I with the fundamentals of legislation and international activities in the area of fighting cybercrime. Students will understand t | | |
| - | tems for computer surveillance and traffic monitoring in the cyberspace. Students will also familiarize themselves with hacker a | activities and beha | vior. The course |
| | peration of the state agencies and subjects dealing with defence of the cyberspace (especially CSIRT and CERT teams). | 1/7 | |
| NI-LSM2 | Statistical Modelling Lab | KZ | 5 |
| • | vanced multiple target tracking (MTT). This domain covers simultaneous tracking of multiple targets using radar under the pre ne-art filters, in particular the PHD (Probability Hypothesis Density) and PMBM (Poisson Multi-Bernoulli) filters. | sence of clutter, of | r video tracking. |
| | Linear Optimization and Methods | Z,ZK | 5 |
| · · | cations of optimization methods in computer science, economics, and industry. They are aware of practical importance of line | | |
| | timization software and are familiar with languages used in programming of that software. They get skills in formalization of c | | |
| • | ling of tasks to processors, analysis of network flows), distribution and allocation of resources (transportation problems, trav | | |
| · | and modelling of conflicts via the game theory. They get an overview of computational complexity of optimization problems. | | |
| in linear programming. | | | |
| NI-MZI | Mathematics for data science | Z,ZK | 4 |
| | are introduced to those fields of mathematics that are necessary for understanding standard methods and algorithms used in | | |
| include mainly: linear alg | gebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality prin | nciple, gradient me | thods) and |
| selected notions from pr | obability theory and statistics. | | |
| NI-NMU | New media in art and design | ZK | 3 |
| The course introduces s | tudents to the issue of using new media in artistic and design work. Key topics are moving image, internet, computer game | and sound. The ma | ain goal is to |
| familiarize the student w | ith the largest possible range of creative approaches in new media. The subject emphasizes dialogue with students, especia | ally in lectures devo | oted to specific |
| art projects. | | | |
| NI-ARI | Computer arithmetic | Z,ZK | 4 |
| Students will learn vario | us data representations used in digital devices and will be able to design arithmetic operations implementation units. | | |
| NI-PG1 | Computer Grafics 1 | ZK | 4 |
| - | aphic courses (mainly BI-PGA and BI-PGR) and the knowledge from these courses is deepened by state-of-the-art knowledge | | - |
| | computer graphics. Students will gain practical knowledge with realistic texturing and raytracing methods. An integral part of t | | - |
| 1 | quent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and | | |
| NI-EDW | Enterprise Data Warehouse Systems | Z,ZK | 5 |
| · | rehouses course focuses on the area of business intelligence. Students will be introduced to business intelligence methods rehouses and various architectures, but also their deployment and maintenance. This course also includes an introduction to | | - |
| visualization. | renouses and various architectures, but also their deployment and maintenance. This course also includes art introduction to | Tille area or report | iling and data |
| T | Advanced Virtual Reality | KZ | 4 |
| INITI VIX | Auvanceu viituai Neality | 112 | - |
| | | odels in Blender a | nd among other I |
| The course introduces a | dvanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D mo | | - |
| The course introduces a things, it introduces stud | | also deal with creat | ting applications |
| The course introduces a things, it introduces stud in available 3D engines | dvanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D months to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will a | also deal with creat | ting applications |
| The course introduces a things, it introduces stud in available 3D engines in virtual reality, or direct | dvanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D motion ents to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will a (mainly Unity3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the tay create a complex game for VR. | also deal with creat | ting applications |
| The course introduces a things, it introduces stud in available 3D engines in virtual reality, or direct NI-IOS | dvanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D modents to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will a (mainly Unity3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the | also deal with creat e knowledge gaine KZ | ting applications ad in this subject |
| The course introduces a things, it introduces stud in available 3D engines in virtual reality, or direct NI-IOS | dvanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D monents to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will a (mainly Unity3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the table to complex game for VR. Advanced techniques in iOS applications | also deal with creat e knowledge gaine KZ | ting applications ad in this subject |

| NI-APT Advanced Program Testing | Z,ZK | 5 |
|--|---------------------------------|-------------------|
| Testing a program is essential to ensure that a program respects its specification, that changes do not introduce regressions or security is | sues. The goal of the course | is to present |
| advanced program testing techniques, beyond writing unit tests, especially fuzzing and symbolic execution. | | |
| NI-PVS Advanced embedded systems | Z,ZK | 4 |
| The course is focused on ARM processors and microcontrollers and their usage in wide range of applications. The course includes a serio | es of advanced topics like se | curity support, |
| working with mass storage devices, motor control, system control and industrial communication. The students obtain both theoretical and | also practical experiences w | ith embedded |
| systems. | | |
| NI-DNP Advanced .NET | Z,ZK | 4 |
| Students will acquire an overview of platform .NET and will gain knowledge about technologies ASP.NET, Entity Framework, WPF, .NET M | MAUI and also will get notions | s of Azure |
| DevOps and GIT. Students will get practical experience in semestral work where they will create a client-server application utilizing technology. | ologies ASP.NET, Entity Fram | ework and |
| (Blazor, .NET MAUI or WPF) and also Azure DevOps and GIT. | | |
| NI-PYT Advanced Python | KZ | 4 |
| The goal of this course is to learn various advanced techniques and methods in Python. The course indirectly continues where Programm | ning in Python (BI-PYT) left of | f. The course is |
| very hands-on and it has only tutorials, everything is demonstrated on examples. Classification is based on work in class as well as semestr | al coursework. The course is | lead by external |
| teachers from Red Hat. | | |
| BI-PJP.21 Programming Languages and Compilers | Z,ZK | 5 |
| Students learn basic compiling methods of programming languages. They are introduced to intermediate representations used in current | compilers GNU and LLVM. The | ney learn to |
| create a specification of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the s | pecification. The compiler ca | n translate not |
| only a programming language but any text in a language generated by a given LL input grammar. | | |
| NI-RUB Programming in Ruby | KZ | 4 |
| This course is presented in Czech. | 1 | |
| NI-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 application | 1 ' | - |
| recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter est | | · · |
| NI-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 are | - | - |
| are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervision | | |
| articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the su | | |
| semester. | similar todorioro. The topico a | iro now for odon |
| NI-SCE2 Computer Engineering Seminar Master II | 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 are | ! ! | • |
| are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisions. | | |
| articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the su | - | |
| semester. | similar teachers. The topics a | ire new ior each |
| NI-SZ1 Knowledge Engineering Seminar Master I | Z | 4 |
| | 1 | - |
| On this seminar you will present a research paper from a top institute / research group to your peers. You will learn what is being cooked in Additionally, you will learn how to properly present and read scientific papers. The work in the seminar will prepare you to attend (and profit from the seminar will prepare you to attend (and profit from the seminar will prepare you to attend (and profit from the seminar will prepare you to attend (and profit from the seminar will prepare you to attend the seminar will be a semin | | |
| and summer schools, as well as FIT's own Summer Research Program (VyLet). | only top macrime learning and | Alconierences |
| NI-SZ2 Knowledge Engineering Seminar Master II | Z | 4 |
| On this seminar you will present a research paper from a top institute / research group to your peers. You will learn what is being cooked in | - | - 1 |
| Additionally, you will learn how to properly present and read scientific papers. The work in the seminar will prepare you to attend (and profit fr | - | |
| and summer schools, as well as FIT's own Summer Research Program (VyLet). | sin) top macrime learning and | 17 ti comercinees |
| PI-SCN Seminars on Digital Design | ZK | 4 |
| This subject deals with problems of realization and implementation of digital circuits - both combinational and sequential. Basic means of | l l | |
| synthesis and optimization algorithms are described. Basics of EDA (Electronic Design Automation) systems are given, together with company of the synthesis and optimization algorithms are described. | | ŭ |
| | <u> </u> | |
| NI-MLP Machine Learning in Practice | Z,ZK | 5 |
| Applying machine learning methods to real projects in practice involves many other necessary tasks - from understanding the intentions of t The course guides students through all phases of a project according to the standard CRISP-DM methodology, not only theoretically but a | | |
| data processing and learn how to describe the whole process from exploration to evaluation of the model performance in the form of a cle | · · · | |
| | 1 1 | |
| BI-SVZ.21 Machine vision and image processing | Z,ZK | 5 |
| Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process a | - | |
| introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused o | n practical use of camera sys | tems for solving |
| problems of practice that the graduates may encounter. | 7.71/ | |
| NI-SEP World Economy and Business | Z,ZK | 4 |
| This course is presented in Czech. However, there is an English variant in the program Informatics (N1801 / 4793). The course introduces | | - |
| international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to kr | - | |
| necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which | - | |
| Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of | | |
| BI-SRC.21 Real-time systems | Z,ZK | 5 |
| Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the depend | · · · · · | - |
| lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kit | s in the lab are the same as i | n the BIE-VES |
| COUISE. | | |
| NI-TVR Virtual Reality Technology | Z,ZK | 3 |
| Students will be introduced to the basic concepts of virtual reality. Techniques for displaying virtual worlds (CAVE, HMD,) and the possil | - | |
| tracking, hand tracking, eye tracking) will be discussed. Furthermore, the concepts of mixed and augmented reality will be introduced. Fin | ally, ways of using virtual and | augmented |
| reality will be presented. | | |
| NI-TS1 Theoretical Seminar Master I | Z | 4 |
| Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is many theoretical computer science and the students which want to come in deeper contact with contemporary theoretical computer science. It is many that the students which want to come in deeper contact with contemporary theoretical computer science. It is many that the students which want to come in deeper contact with contemporary theoretical computer science. It is many that the students which want to come in deeper contact with contemporary theoretical computer science. It is many that the students which want to come in deeper contact with contemporary theoretical computer science. It is many that the students which want to come in deeper contact with contemporary theoretical computer science. | , | |
| are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the | ne course is a work with scier | ititic papers and |
| other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. | | |
| | | |
| | | |

NI-TS2 Theoretical Seminar Master II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar Master III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. Theoretical Seminar Master IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. NI-TKA **Category Theory** NI-TNN Theory of Neural Networks Z,ZK In this course, we study neural networks from the point of view of the theory of function approximation and from the point of view of probability theory. At first, we recall basic concepts pertaining to artificial neural Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission, network topology, somatic and synaptic mappings, network training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transformation into a canonical topology, and in connection with somatic and synaptic mappings, with their composition into mappings computed by the Network, Finally in connection with training, we pay attention to the problem of overtraining and to the fact that training is actually a specific optimization task, recalling the most typical objective functions and the most important optimization methods employed for neural network training. We will see the meanining of all these concepts in the context of common kinds of forward neural networks. Within the topic approximation approach to neural networks, we first notice the connection of neural networks to expressing functions of many variables using functions of fewer variables (Kolmogorov theorem, Vituškin theorem). Afterwards, we will see how the universal approximation capacity of neural networks can be mathematically formalized as the sets of mappings computed by neural networks being dense in important Banach spaces of functions, in particular in the spaces of continuous functions, spaces of functions integrable with respect to a finite measure, spaces of functions with continuous derivatives, and Sobolev spaces. Within the topic probabilistic approach, we first get acquainted with training based on expectation and training based on a random sample, and with probabilistic assumptions about training data with which those two kinds of neural networks can be employed. We will see how it is possible to get an estimate of the conditional expectancy of network outputs conditioned by its inputs using the expectancy based learning. We recall the strong and the weak law of large numbers and get acquainted with an analogy of the strong law of large numbers for neural networks and with the assumptions for its validity. Finally, we recall the central limit theorem, get acquinted with its analogy for neural networks, with the assumptions for its validity and with the hypothesis tests based on it. We will see how those tests can be employed to search for the topology of the network. NI-CPX Complexity Theory 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. NI-DVG Introduction to Discrete and Computational Geometry 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. Z,ZK BI-VHS.21 Virtual game worlds In the course students learn methods to create a complex virtual world. It is a follow-up course of basic courses of the PG specialization (BIE-MGA, BIE-PGR). Students gain knowledge of the theory of game design, of principles of writing dialogues and characters in order to create a functional virtual world. Within the labs they get practical skills within team development work on the semester project. NI-VOL Z,ZK 5 Elections We will cover the basics of (committee) elections and, in general, opinion aggregation NI-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. Z Master internship abroad for 10 credits Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. NI-ZS20 Master internship abroad for 20 credits Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. NI-ZS30 Master internship abroad for 30 credits Ζ 30 The course is prezented in chzech language. Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.

List of courses of this pass:

| Code | Name of the course | Completion | Credits |
|---------|--------------------|------------|---------|
| BI-3DT. | 3D Printing | KZ | 4 |

| BI-A2L | | | |
|--|--|--|--|
| | English language, preparation for the B2 level exam | Z | 2 |
| The content of the | course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement - | students are due | to: -Take an |
| active part in the | language instruction Meet the requirements for writing assignments - Summary, Abstract, Argumentation Paper Succeed in both the | e midterm and the | e final term |
| tests with the succ | ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi | vidual teachers du | uring the first |
| | class of the term. | 1 | _ |
| BI-ACM | Programming Practices 1 | KZ | 5 |
| | This course is presented in Czech. | | |
| BI-ACM2 | Programming Practices 2 | KZ | 5 |
| | This course is presented in Czech. | • | , |
| BI-ACM3 | Programming Practices 3 | KZ | 5 |
| | This course is presented in Czech. | | |
| BI-ACM4 | Programming Practices 4 | KZ | 5 |
| | This course is presented in Czech. | | 1 |
| BI-ADW.1 | Windows Administration | Z,ZK | 4 |
| | This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). | _, | |
| BI-AG2.21 | Algorithms and Graphs 2 | Z,ZK | 5 |
| | ented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory | | _ |
| - | ces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Engl | | |
| | BIE-AG2.21. | | |
| BI-ALO | Algebra and Logic | Z,ZK | 4 |
| | The course extends and deepens the study of topics touched upon in the basic course in logic. | , | 1 |
| BI-AND.21 | Programming for the Android Operating System | KZ | 4 |
| 2.7 | This course is presented in Czech. | | |
| BI-ANGK | English language, contact preparation for the B2 level exam | Z | 2 |
| | course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement | | 1 |
| | language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the | | |
| | ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by indi | | |
| | class of the term. | | J |
| BI-APJ | Aplication Programming in Java | Z,ZK | 4 |
| 2.7 0 | This course is presented in Czech. Advanced technologies in Java. | _, | |
| BI-APS.21 | Architectures of Computer Systems | Z.ZK | 5 |
| _ | rn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec | , | _ |
| | n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the princ | | |
| not only in scala | r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of | the sequential mo | odel of the |
| program. The cours | se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe | rence and consist | ency in such |
| | systems. | | |
| | oyotome. | | |
| BI-ARD | Interactive applications on Arduino | KZ | 4 |
| | | l | 1 |
| The subject is design | Interactive applications on Arduino | ions for modern pr | ogrammable |
| The subject is designated kits and control variables | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore | ions for modern pr ystems, i.e. to see | ogrammable the results |
| The subject is design kits and control variations | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s | ions for modern pr ystems, i.e. to see | ogrammable the results |
| The subject is design kits and control variations | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore | ions for modern pr ystems, i.e. to see | ogrammable the results |
| The subject is design kits and control vant only on displating BI-AVI.21 | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s any of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. | ions for modern pr ystems, i.e. to see is suitable even fo Z,ZK | ogrammable the results or Web and |
| The subject is design kits and control vanot only on displation BI-AVI.21 The course complete is the subject to the subject is design to the subject to the subject is design to the subject to the subje | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicate a ried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded stay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. Algorithms visually ements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer sceed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org&I | ions for modern pr ystems, i.e. to see is suitable even fo Z,ZK ience that extend | ogrammable the results or Web and 4 substantially |
| The subject is designed in the subject is designed in the subject is and control various is a subject to the subject in the subject is and control various var | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicate a ried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded stay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. Algorithms visually ements other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so | ions for modern pr ystems, i.e. to see is suitable even fo Z,ZK ience that extend t;http://www.algovi | ogrammable the results or Web and 4 substantially sion.org>) |
| The subject is designed in the subject is designed in the subject is designed in the subject is designed in the subject in the | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicate a ried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded stay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. Algorithms visually sments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so and in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org&I that make understanding the principles of algorithms easy. Secure Code | ions for modern pr ystems, i.e. to see is suitable even for Z,ZK ience that extend t;http://www.algovi | ogrammable the results or Web and 4 substantially sion.org>) |
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| The subject is designed in the subject is designed in the subject is designed in the subject in | Interactive applications on Arduino gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. Algorithms Visually Interest of the computer so and in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org&l that make understanding the principles of algorithms easy. Secure Code Interest of their own code and solutions. After getting fa signing practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the Blender disk knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those in offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph Compiler Construction uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching Programming in C# urse is to introduce. NET Framework as a multi-language development platform. Then, programming language C#, its fundamental costs, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def ods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging | ions for modern prystems, i.e. to see is suitable even for a z,ZK idence that extend t;http://www.algovithttp://www.algovithttp://www.algovithttp://www.algovithttp://www.algovithttp://www.algovithttp://www.algovithttp://www.algovithtp://www.alg | ogrammable the results of Web and 4 substantially sion.org>) 5 eat modeling or run with ionships of a them. 4 aphics and course. 5 tudents to ss. 4 of variables, astancing, poessing, as tudents will LINQ - a set INQ to XML siffic objects and Mapping |
| The subject is designed in the subject is designed in the subject is designed in the subject in | Interactive applications on Arduino grad for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat aried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students. Algorithms visually ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so ed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org&l that make understanding the principles of algorithms easy. Secure Code arm how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fit e gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every evileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and th Blender ds knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those i before a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph Compiler Construction uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles and the design and implementation of programming language development platform. Then, programming language C#, its fundamental cs, loops, definitions and calls of functions will be discussed. Attention is focused on the object | ions for modern prystems, i.e. to see is suitable even for the see is suitable even for the suitable even for | ogrammable the results of Web and 4 substantially sion.org>) 5 eat modeling or run with ionships of a them. 4 aphics and course. 5 tudents to as: 4 of variables, astancing, pocessing, as 4 students will LINQ - a set INQ to XML iffic objects and Mapping |

| BI-EHA.21 | Ethical Hacking | Z,ZK | 5 |
|-----------------------|--|----------------------|-----------------|
| _ | ourse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln | | |
| exploitation in com | nputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is | on hands-on expe | erience with |
| DI E IA | vulnerabilities testing and the following process of penetration test documentation. | 7 71/ | |
| BI-EJA | Enterprise Java | Z,ZK | 4 |
| The course is on a | dvanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sy a database and are accessed through the web interface. | stems which are co | onnected to |
| BI-EJK | Enterprise Java and Kotlin | Z,ZK | 4 |
| | The prise daya and Rottin Rottin and Kotlin programming languages. The focus is on technologies for developing enterprise information and the control of the | | 1 |
| 1110 000130 13 011 00 | architecture, that can be deployed to the cloud. | iion systems with i | THO TO SOT VICE |
| BI-EP1.24 | Effective programming 1 | KZ | 4 |
| | The course is taught in Czech. | 1 | |
| BI-EP2 | Efficient Programming 2 | KZ | 4 |
| | ficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indivi | 1 | discussed, |
| | with the aim to choose the best one and avoid implementation errors. | | |
| BI-FMU | Financial and Management Accounting | Z,ZK | 5 |
| | rse is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the pa | - | |
| | unts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification | | - |
| of economic oper | ations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of manage | ment accounting a | are base of |
| DI ETD 4 | Business Inteligence moduls in Business information systems. | 7 71/ | |
| BI-FTR.1 | Financial Markets | Z,ZK | 5 |
| DI OIT | This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). | 1/7 | |
| BI-GIT | Version control system GIT troduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pract | KZ | 2 |
| | mplementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git: | | - |
| BI-HAM | HW accelerated network traffic monitoring | KZ | 4 |
| | duces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The | 1 | I |
| | mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a s | _ | - |
| | oals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traff | | |
| , , , | level and to develop their practical abilities in this field. | | |
| BI-HAS | Human Aspects in Cryptography and Security | Z,ZK | 5 |
| This course is for | students interested not only in technical scope of computer science, but also in making products usable - for users and for developer | s. Students of this | course can |
| | use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security. | | |
| BI-HMI | History of Mathematics and Informatics | Z,ZK | 3 |
| | This course is presented in Czech. | | |
| BI-IOS | Fundamentals of iOS Application Development for iPhone and iPad | KZ | 4 |
| | This course is presented in Czech. | T | |
| BI-JPO.21 | Computer Units | Z,ZK | 5 |
| | their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail v | | |
| _ | nputer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using approp e organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, includin | • | |
| • | e organization of main memory and other memorial memorias (addressable, Eli O, 1 ii O and CAM) will be discussed in detail, including the land serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of comm | • | |
| | d the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational micropro | | |
| | and programmable hardware design kits (FPGA). | | |
| BI-KOT | Programing in Kotlin | Z,ZK | 4 |
| | i, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advar | | nstructions. |
| The language is fu | Ily Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a | modern, object-fur | nctional way |
| | with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages |). | |
| BI-KSA | Cultural and Social Anthropology | ZK | 2 |
| | course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversit | - | |
| anthropological res | earch from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, healt | h, history, death, e | tc) will be |
| 51.447 | shown. The course is presented in Czech. | 147 | |
| BI-MIT | Mikrotik technologies | KZ | 3 |
| | on of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are cor vice providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the m | | |
| | trate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer ne | | |
| | and technologies of the data-link, network and transport layer of the OSI model. | | |
| BI-MMP | Multimedia team project | KZ | 4 |
| | This course is presented in Czech. | 1 | |
| BI-MPP.21 | Methods of interfacing peripheral devices | Z,ZK | 5 |
| | sed on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universa | | 1 |
| | side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USI | | |
| | drivers, simple application development, and APIs of selected devices. | | |
| BI-MVT.21 | Modern Visualisation Technologies | Z,ZK | 5 |
| _ | urse is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augn | - | |
| high resolution disp | plays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned | ed technologies, na | amely fractal |
| | and procedural visualization, scientific data visualization, and 3D model scanning. | T = ==== | |
| BI-OPT | Introduction to Optical Networks | Z,ZK | 4 |
| _ | overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on poss | • | |
| · · | technology and on their solutions. The course will include the history of optical communications, an overview of passive components | | - |
| uspersion compen | sators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission system | noj. The course Wi | iii aisu cover |

| • | e topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as ncy transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. Second from practice. | | |
|-----------------------|---|-----------------------|-------------|
| BI-ORL | Operations Research and Linear Programming | KZ | 5 |
| | o introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundamenal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (sucl | nental optimization | |
| BI-PHP.1 | Programing in PHP | KZ | 4 |
| | lught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for | | |
| | register for this course in their 3rd semester of study. | | |
| BI-PJP.21 | Programming Languages and Compilers | Z,ZK | 5 |
| | asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers GN | | - |
| | ion of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. The only a programming language but any text in a language generated by a given LL input grammar. | · | |
| BI-PJS.1 | JavaScript Programming | KZ | 4 |
| ŭ | course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development tudents of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for th of study. | | |
| BI-PJV | Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). | Z,ZK | 4 |
| BI-PKM | Introduction to mathematics This course is presented in Czech. | Z | 4 |
| BI-PMA | Programming in Mathematica | Z,ZK | 4 |
| | rking with modern technical and scientific software. Students will learn how to use different programming styles (functional programm etc.), how to create dynamic interactive applications and visualisations, data processing and presentations. | , | ogramming, |
| BI-PS2 | Programming in shell 2 | Z,ZK | 4 |
| Students gain a ge | neral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In additic into shell and some other particular scripting languages and will get practical experience with shell script programming. | on, they gain a dee | per insight |
| BI-QAP | Quantum algorithms and programming | KZ | 5 |
| = | ng students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, or | · · | - 1 |
| | orithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software developm ge. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM | | |
| | might be an advantage. No previous knowledge of physics is assumed. | | |
| BI-QUA | Quality Assurance | KZ | . 4 |
| | duces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of the semester, the student should experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should | | |
| | n a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found | | |
| BI-SCE1 | Computer Engineering Seminar I | Z | 4 |
| The Seminar of Cor | mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to | failures and attack | s. Students |
| | dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher semester. | • | |
| BI-SCE2 | Computer Engineering Seminar II | Z | 4 |
| | mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to | | |
| | dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the rofessional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers semester. | · · | |
| BI-SKJ.21 | Scripting Languages | Z,ZK | 4 |
| | eneral overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In addition into shell and some other particular scripting languages and will get practical experience with shell script programming. | | |
| BI-SOJ | Machine Oriented Languages | Z,ZK | 4 |
| | rse will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use ration of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view lin This knowledge will be used during reverse engineering, optimization, and evaluation of code security. | · · | |
| BI-SQL.1 | Language SQL, advanced | KZ | 4 |
| | knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa | l, | |
| triggers, recursive q | queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of | of view of specialize | d database |
| | exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan an d. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Ora PostgreSQL. | - | |
| BI-SRC.21 | Real-time systems | Z,ZK | 5 |
| Students obtain th | ne basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Derimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are | Theoretical knowle | edge from |
| · | course. | | |
| BI-ST1 | Network Technology 1 | Z | 3 |
| The subject is ori | ented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited CCNA1 - R&S Introduction to Networks. | I under the Cisco N | Netacad - |
| BI-ST2 | Network Technology 2 | Z | 3 |
| | This course is presented in Czech. | | |

| BI-ST3 Network Technology 3 | Z | 3 |
|--|--|--|
| Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predic | | |
| simple topology, security, etc. | clability, exterision | beyond a |
| BI-ST4 Network Technology 4 | Z | 3 |
| Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching provided in the students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. | _ | |
| BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficie beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely | | |
| Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch | | |
| recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigatio | | . |
| network running. | | |
| BI-STO Storage and Filesystems The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archive the student will be a store of the storage of the storage of the storage and Filesystems. | Z,ZK | 4 |
| load balancing and high availability. | ing, as so as store | age scalling, |
| BI-SVZ.21 Machine vision and image processing | Z,ZK | 5 |
| Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in | _ | |
| ntroduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use problems of practice that the graduates may encounter. | of camera systems | s for solving |
| BI-TDA Test driven architecture | KZ | 4 |
| The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are | | e DevOps |
| world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur | | |
| BI-TEX TeX and Typography This course is presented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the c | Z,ZK | 4 typographic |
| rules. | ourse locuses our | iypograpriic |
| BI-TS1 Theoretical Seminar I | Z | 4 |
| Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical | | |
| are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a w other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. | ork with scientific | papers and |
| BI-TS2 Theoretical Seminar II | Z | 4 |
| Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical | al reading group. Th | he students |
| are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a w | ork with scientific | papers and |
| other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-TS3 Theoretical Seminar III | 7 | 4 |
| Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical | ا al reading group. Th | |
| are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a w | ork with scientific | papers and |
| other achalastic literature. The connectivity is limited by the the notantials of the tapphare of the comingr | | |
| other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. | | |
| BI-TS4 Theoretical Seminar IV | Z | 4 he students |
| | al reading group. Th | he students |
| BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. | al reading group. The vork with scientific | he students papers and |
| BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-ULI Introduction to Linux | al reading group. The vork with scientific | he students papers and |
| BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a worker scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-ULI Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with the seminar in the seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work of the seminar. | al reading group. The vork with scientific Z amiliar with basic comments. | he students papers and |
| BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. BI-ULI Introduction to Linux | al reading group. The vork with scientific Z amiliar with basic comments. | he students papers and |
| BI-TS4 Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a water treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a water treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a water treated individually and tenesting part of the course is a water treated individually and the part of the seminar. BI-ULI Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become family and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (tenesting the course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basics of the course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basics of the course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basics of the course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. | al reading group. The proof of | he students papers and 2 commands 3 oproach the |
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interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies. BI-7NF PHP Framework Nette - basics K7 3 Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language. Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise. **BI-ZRS** Basics of System Control The course gives an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. BI-ZS10 Bachelor internship abroad for 10 credits 10 Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZS20 Bachelor internship abroad for 20 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. Bachelor internship abroad for 30 credits Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. BI-ZWU Z,ZK Introduction to Web and User Interfaces This course is presented in Czech. BIE-ADW.1 Windows Administration Z.ZK 4 Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network. **BIE-CCN** Z,ZK Compiler Construction 5 This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles of compilers for students to understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme of the class. Introduction to Computer Science This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fields but interested in computer science, high-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The goal of the class is to introduce and relate basic principles of computer science for students to understand, early on, what computer science is, why things such as high-level programming languages and tools are done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer not just basic computer science questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interested in computer science more than expected, or even less than before. BIE-CZ0 Czech Language for Foreigners ΚZ 2 Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family. Czech Language for Foreigners II BIE-CZ1.21 ΚZ 2 The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The course further expands the basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech Republic Introduction to European Economic History 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. BIF-FPR Economic project 1 This course is an extension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will contact you before the start of the semester. **Financial Markets** Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.

| BIE-HAS | Human Factors in Cryptography and Security | Z,ZK | 5 |
|--|--|--|--|
| | students interested not only in technical scope of computer science, but also in making products usable - for users and for developer | 1 | course can |
| | use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security. | | |
| BIE-IMA | Introduction to Mathematics | 7 | 4 |
| | indicate to the arternation in t | | |
| Otadonio renesir a | examples. | able to apply them i | ii particulai |
| | | 7 | |
| BIE-IMA2 | Introduction to Mathematics 2 | Z | 2 |
| Students refresh a | and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a | able to apply them I | n particular |
| | examples. | | |
| BIE-OOP | Object-Oriented Programming | Z,ZK | 4 |
| | programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together | | - |
| course we look at | some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software develo | pment including te | sting, error |
| | handing, refactoring and design patterns. | | |
| BIE-PJV | Programming in Java | Z,ZK | 4 |
| The course Progra | imming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java la | nguage the fundar | nental APIs |
| | will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs. | | |
| BIE-PKM | Preparatory Mathematics | Z | 4 |
| D.L | The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics | | · |
| BIE-PRR.21 | Project management | Z,ZK | 5 |
| | | | |
| | purse is to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, ana | - | |
| | cation, argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk as | | - |
| | source schedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for st | | |
| deepening their k | knowledge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in lar | rge companies. The | course is |
| | also suitable for all those who will develop software or hardware in the form of team projects. | | |
| BIE-PS2 | Programming in shell 2 | Z,ZK | 4 |
| Students get a ger | neral overview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit | ion, they gain a dee | eper insight |
| into Bourne Again | shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus st | udents: We are rea | dy do adapt |
| the lectures to pro | ovide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, In, | mkdir, rm) and u | seful basic |
| data filtering too | ls (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a sel | ection of advanced | scripting |
| | techniques used in practice. | | |
| BIE-SCE1 | Computer Engineering Seminar I | 7 | 4 |
| | mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to | n failures and attack | s. Students |
| | individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the | | |
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| BIE-SCE2 | Computer Engineering Seminar II | | 4 |
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| The Seminar of Co | , , , | failures and attack | 4 re Studente |
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| BIE-SEG This is an introduct to understand product understand product understand product understand the BIE-SEP The course introd Students get to development, which development, which belies a ger into Bourne Against the lectures to product filtering tool BIE-ST1 The course is for BIE-TUR.21 Students gain a bottom boundary in the section of BIE-VAK.21 The course aims to issue from applicative with the active par will select problem. | Imputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the professional literature and/or work in K. N. laboratories. The capacity of the subject is limited by the possibilities of the seminar teaches semester. Systems Engineering Gystems Engineering Systems Engineering Systems Engineering Systems Engineering Government of the class is to introduce basic principles of pressor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what concarred parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication. World Economy and Business Uncessure students of technical university to the international business. It does that predominantly by comparing individual countries and know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedors that he needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual coverview of scripting languages, introduction into syntax, semantics, programming style, data structures, pros and cons. In addit shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus stavide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp. In, Is (cut, tr., sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a set techniques used in practice. Network Technology 1 cused on essentials of compu | subject is work with rs. The topics are not read the class, students incurrency is, as opportunity as a subject in the class, students incurrency is, as opportunity as a subject in the class, students incurrency is, as opportunity as a subject in the class, students incurrency is, as opportunity as a subject in the class, students in the class of the class incurrency is, as opportunity as a subject in the class incurrency is, as opportunity as a subject in the class in | ss. Students th scientific ew for each Offor students are able to posed to 4 economy. conomic advised to 4 eper insight dy do adapt seful basic scripting 3 R&S 5 tets do not ethods that 3 oproach the urthermore, in which we udents will |

| be definitely evalu- control of engineer | Basics of Systems Control lasics of Systems Control lasics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the lated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus ring and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will tear | s our attention partich ch you description n | cularly on nethods of |
|---|---|---|-----------------------------|
| methods of creating is also given to ser | sic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD insors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller paramet nentation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful exam implementations. | and fuzzy controllers ers and certain asp | s. Attention ects of the |
| BIE-ZUM | Artificial Intelligence Fundamentals | Z,ZK | 4 |
| Students are introd space search, mult | uced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classic i-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithm be presented as well. | s and the neural ne | tworks, will |
| MI-SCE1 | Computer Engineering Seminar Master I mputer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to | Z Z | 4 Students |
| are approached in | dividually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the professional literature and/or work in K. N laboratories. The capacity of the subject is limited by the possibilities of the seminar teacher semester. | subject is work with | n scientific |
| 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 dance algebra (matrix factorisations, eigenvalues, diagonalization), continuous optimisation (optimisation with constraints, duality prince selected notions from probability theory and statistics. | ata science. The stu | - 1 |
| MIE-SEP | World Economy and Business | Z,ZK | 4 |
| | uces students of technical university to the international business. It does that predominantly by comparing individual countries and k | | |
| _ | know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom | • | |
| development, which | h are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on indiv take bachelor level of this course BIE-SEP as a prerequisite. | idual readings. It is | advised to |
| NI-AFP | Applied Functional Programming | KZ | 5 |
| | ented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional p | | - |
| | and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, master necessary competence of a software engineer: the theory and especially the practice. | | |
| NI-AML | Advanced machine learning | Z,ZK | 5 |
| | ces students to selected advanced topics of machine learning and artificial intelligence. The topics present techniques in the field of rec | | - 1 |
| NI-APH | control and interconnection of physical laws with the field of machine learning. The aim of the exercise is to familiarize students with the field of machine learning. The aim of the exercise is to familiarize students with the field of machine learning. The aim of the exercise is to familiarize students with the field of machine learning. | ne metnoas aiscus: | 4 |
| | Architecture of computer games basic understanding of the various issues in the field of computer games development, especially from a technical point of view, but also | , , , , , , , , , , , , , , , , , , , | |
| - | vill get a grasp of component-oriented and functional-oriented architecture, game mechanics, decision-making processes and base co | | |
| part of most game | es. They will also understand the basics of pathfinding, networking and scripting and apply them in practical exercises (labs). An imposimplementation of a simple game, with a strong focus on nontrivial game mechanics. | rtant part of the co | urse is an |
| NI-APT | Advanced Program Testing | Z,ZK | 5 |
| Testing a program | n is essential to ensure that a program respects its specification, that changes do not introduce regressions or security issues. The go advanced program testing techniques, beyond writing unit tests, especially fuzzing and symbolic execution. | al of the course is t | o present |
| NI-ARI | Computer arithmetic | Z,ZK | 4 |
| | Students will learn various data representations used in digital devices and will be able to design arithmetic operations implementa | | |
| NI-ATH | AlgorithmicTheories of Games | Z,ZK | 4 |
| _ | theory is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory studies are competitive process by designing a mathematical model and investigating the strategies. The traditional task of classical game to | | - 1 |
| | s of the game where no player wants to deviate from his strategy. Due to the recent development of computers, internet, social network | = | - |
| multiagent system | s and other concepts the algorithmic point of view is gaining attention. In addition to existential questions we study the problems of ef | ficient computation | of various |
| | concepts. In this course we introduce the basics of game theory of many players, solution concept (usually equilibria) and methods of | | |
| NI-BPS | Wireless Computer Networks | Z,ZK | 4 |
| | n about the modern technologies, protocols, and standards for wireless networks. They will understand the routing mechanisms in ad nisms, and data flow control mechanisms. They will also learn about principles of communication in sensor networks. They get knowle | | |
| | for wireless networks and get skills of configuration of wireless network elements and simulation of wireless networks using suitable | - | |
| NI-CCC | Creative Coding and Computational Art | KZ | 4 |
| Students work on p | practical tasks, get acquainted with creative and yet proven methods of visualizing various types of data. The course freely follows the | basic graphics cour | ses (MGA, |
| | luces students to suitable visualization methods for traditional as well as for open data. It combines well-known visualization techniqu | | ٠ ١ |
| modern technologi | es. The aim is to create an interesting visualization project. It is planned to work closely with IPR CAMP (Center of Architecture and M (Institute of Intermedia FEL). | /letropolitan Plannir | ng) and IIM |
| NI-CPX | Complexity Theory | Z,ZK | 5 |
| | n about the fundamental classes of problems in the complexity theory and different models of algoritms and about implications of the | · · · · · · · · · · · · · · · · · · · | |
| | (in)tractability of difficult problems. | | |
| NI-CTF | Capture The Flag The course is designed to introduce students to CTF competitions and let them gain practical experience in the field of cyber se | KZ curity. | 4 |
| NI-DDM | Distributed Data Mining | KZ | 4 |
| | state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands of | | |
| data processing fra | amework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a approaches to parallelize other algorithms. The course is prezented in czech language. | ind will be capable t | o propose |
| NI-DID | Digital drawing | Z | 2 |
| | oduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, persp | | - 1 |
| | r apply in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The course relearn drawing and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practice. | • | |
| | | | |

| NI-DNP | Advanced .NET | Z,ZK | 4 | |
|---|--|---|-------------------------------------|--------|
| Students will ac | quire an overview of platform .NET and will gain knowledge about technologies ASP.NET, Entity Framework, WPF, .NET MAUI and a | so will get notions | of Azure | • |
| DevOps and GI | T. Students will get practical experience in semestral work where they will create a client-server application utilizing technologies ASP | NET, Entity Frame | work and | d |
| | (Blazor, .NET MAUI or WPF) and also Azure DevOps and GIT. | | _ | |
| NI-DPH | Game Design | Z,ZK | 5 | . |
| | ments the NI-APH (Architecture of Computer Games) and BI-VHS (Virtual gaming worlds) course, while focusing primarily on game of | | | |
| - | er knowledge of the principles used for games design, such as: level design, gameplay design, character design, game mechanics of . The students will get an overview of game development from the designer's perspective, from theoretical concepts to practical impler | | - | - 1 |
| development cycle | projects. | mentation applied t | io semes | oliai |
| NI-DSP | Database Systems in Practes | Z,ZK | 4 | |
| 111 201 | This course is presented in Czech. | _,,, | | |
| NI-DSW | Design Sprint | Z | 2 | |
| Students will work | on projects using the Design Sprint method, developed by Google. THanks to this method the teams are able to go from idea to valida | ted prototype in 5 c | days. Dui | ring |
| the course the st | udents will get familiar with the method as participants. Through practical challenges they will try the whole 5 day process starting wit | n research and fini | ishing wi | th |
| | testing the prototypes (plus final presentation). | | | |
| NI-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 fundame | ental noti | ons |
| | of this discipline, and to be able to solve simple algorithmic problems with a geometric component. | | | |
| NI-DZO | Digital Image Processing | Z,ZK | 4 | |
| | ents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical alg | | - | - 1 |
| • | e an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also | | | - 1 |
| | processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR | • | - | - 1 |
| | abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray convigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, as | | | - 1 |
| | | | | • |
| NI-EDW | Enterprise Data Warehouse Systems ta Warehouse Systems ta Warehouses course focuses on the area of business intelligence. Students will be introduced to business intelligence methods and | Z,ZK | 5 | 400 |
| · · | ing warehouses course rocuses on the area of business intelligence. Students will be introduced to business intelligence methods and ing warehouses and various architectures, but also their deployment and maintenance. This course also includes an introduction to the course also include a course a co | | | - 1 |
| not only in design | visualization. | ie area or reporting | g and da | iia |
| NI-ESC | Experimental Project Course | KZ | 8 | |
| | ct course offers a holistic exploration of the design process, providing students with a well-rounded understanding of the principles, n | l I | _ | ed l |
| | ology-driven solutions that are user-centric and industry-relevant. Throughout the semester, students will work on real-world design pro | - | | - 1 |
| | n to integrate theory with practical application. Through a hands-on, project-based learning approach, students will develop their skills | • | | ٠, |
| , , | user experience evaluation, as well as gain experience working in a team to design and prototype a functional solution." | | Ü | |
| NI-FMT | Finite model theory | Z,ZK | 4 | |
| The aim of the cou | rse is to introduce students to the basics of finite model theory. The original motivation is the questions expressibility and verifiability of | | of datab | ase |
| systems. Since its | nception in the 1970s, the course has evolved rapidly and touched on many other areas of theoretical computer science, such as de- | scriptive complexity | y theory, | the |
| | Constraint Satisfaction Problem (CSP), the theory of algorithmic meta-theorems and combinatorics. | | | |
| NI-GLR | Games and reinforcement learning | Z,ZK | 4 | |
| The field of reinfor | cement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelliger | | intended | l to |
| | give you both theoretical and practical background so you can participate in related research activities. Presented in Englis | | | |
| NI-GNN | Graph Neural Networks | Z,ZK | 4 | |
| | oduces students to advanced artificial intelligence techniques for working with graphs. Lectures will focus on the latest graph neural r | | - | - 1 |
| representations of | of nodes, edges and entire graphs. The techniques discussed cover various types of graphs, including time-varying graphs. The last p | | iso cove | rs |
| NII ODI | graph generation and interpretability of graph neural networks. In the exercises, students will try out selected techniques and pro | | _ | |
| NI-GRI | Grid Computing Grid computing and gain knowledge about the world-wide network and computing infrastructure. | Z,ZK | 5 | |
| NI LICM | | ZK | | |
| NI-HCM | Mind Hacking is an emerging discipling that is closely related to exhar sequrity While the demain of exhar sequrity is the protection of networks, info | | 5 | |
| | is an emerging discipline that is closely related to cyber security. While the domain of cyber security is the protection of networks, inf nitive security is the protection of the human mind from intentional and unintentional digital manipulation. The topic of cognitive secur | - | | - 1 |
| _ | nation warfare, increasing digital dependence and the development of artificial intelligence, where these phenomena from the Internet | | | - 1 |
| | impacts such as disruption of social cohesion, threats to democracy or war. | | | |
| NI-HMI2 | History of Mathematics and Informatics | ZK | 3 | |
| | esented in Czech. Selected topics {Infinitesimal calculus, probability, number theory, general algebra, different examples of algorithm | | Į. | ⁄e |
| | functions, eliptic curves, etc.) note on possibilities of applications of some mathematical methods in informatics and its develop | | | |
| NI-HSC | Side-Channel Analysis in Hardware | Z,ZK | 4 | |
| | dicated to so-called side-channel information leakage in hardware devices. It focuses on both theoretical analysis and practical attac | | miliar wit | th |
| various kinds of s | ide channels and they get deeper insight in power attacks. Students learn to implement various profiled and non-profiled attacks and | get familiar with high | gher-ord | ler |
| attacks. T | hey also get practice in both designing the SCA countermeasures and analyzing the amount and characteristics of the side-channel | information leakag | je. | |
| NI-IAM | Internet and Multimedia | Z,ZK | 4 | |
| | se is focused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acq | | | |
| • | signals (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical under the control of t | | | - 1 |
| | nissions. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the eff | • | | - 1 |
| ule quality and late | ncy of AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording th for audience. | s scene up to the p | nesenta | uOI) |
| NI-IBE | Information Security | ZK | 2 | |
| | I IIIOIIIalion Security | <u>∠</u> r\ | I | hev |
| | l · · · · · · · · · · · · · · · · · · · | al standards in this | יי כבוג: | ıı∵v l |
| | rmation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation | | | |
| understan | ormation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g. | , penetration testin | ng). | |
| understan NI-IKM | brmation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g. Internet and Classification Methods | , penetration testin | ng). | |
| understan NI-IKM In this course, the | ormation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g. | , penetration testin | ng). 4 on syste | ms, |
| understan NI-IKM In this course, the s in malware detect | ormation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g. Internet and Classification Methods students get acquainted with classification methods used in four important internet, or generally network applications: in spam filtering | , penetration testin Z,ZK I, in recommendation these four kinds of | ng). 4 on syste f problen | ms, |
| understan NI-IKM In this course, the sin malware detect On the background | brmation and IS/ICT security management systems (ISMS), methods for information access control, and basic norms and internation d methods for management of internal and external security threats, for IS/IT security audits, and for application security testing (e.g. Internet and Classification Methods students get acquainted with classification methods used in four important internet, or generally network applications: in spam filtering for systems and in intrusion detection systems. However, they will learn more than only how classification is performed when solving | , penetration testin Z,ZK g, in recommendation these four kinds of with 2-hour lectures | ng). 4 on system f problen and 2-h | ms, |

NI-IOS Advanced techniques in iOS applications ΚZ 4 Students will learn the latest trends in mobile development technologies for iOS platform. Class covers advanced topics, students need to know all the basics from the beginners class BI-IOS. Internet of Things The subject is focused on the area of hardware and software technologies for the strongly growing computer support of various devices. Its goal is familiarization with available development elements (Raspberry Pi, Arduino Due) and with the language for efficient application development and modification (GNU Forth). NI-IVS Intelligent embedded systems K7 Intelligent embedded systems course for master's degree is focused on high-level technology embedded systems integrating artificial intelligence. The course is an advance version of the Intelligent embedded system fundamentals course for the bachelor degree. The aim of the course is to teach students humanoid robot programming and advance application development. Lectures provide basis of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students develop advanced applications combining knowledge of various courses like nature inspired algorithms, data mining algorithms, image recognition and web technologies NI-KTH Combinatorial Theories of Games Traditional game theory is a branch of mathematics, which has broad applications in economy, biology, politics and computer science. This theory studies the behaviour of agents (players) of a certain competitive process by designing a mathematical model and investigating the strategies. The traditional task of classical game theory is to find the equilibria, which are the states of the game where no player wants to deviate from his strategy. Historically, the second big development in game theory of two-player full-information combinatorial games, was by Conway, Berlekamp and Guy. They developed a theory, originally used for solving end-games in Go, into a full fledged field. The idea is to evaluate games such that otherwise incompatible games can be added, that is, played simultaneously. This led to the algrebraic approach to study combinatorial games. The third most important step is the work of Beck, who established the theory of positional games (like tic-tac-toe and hex). In analysis of these game, one cannot escape the brute-force traversal of the game tree, which is no efficient. Beck introduced the "false probabilistic method", which aims to tackhle this problem. In this course we build the foundation of the theory of combinatorial and positional games. We focus on theoretical analysis of games and building the theory, not on the programming aspects of game solving algorithms. The course requires independent work, ability to mathematically analyse, think and proof. The course is also suitable for bachelors student in the third year, who attended introduction to graph theory, as well as for PhD students looking for research topics. NI-KYB Cybernality Students get acquainted with the fundamentals of legislation and international activities in the area of fighting cybercrime. Students will understand the classification of attacks and have an overview of systems for computer surveillance and traffic monitoring in the cyberspace. Students will also familiarize themselves with hacker activities and behavior. The course will also discuss the cooperation of the state agencies and subjects dealing with defence of the cyberspace (especially CSIRT and CERT teams). NI-LOM Linear Optimization and Methods Students learn the applications of optimization methods in computer science, economics, and industry. They are aware of practical importance of linear and integer programming. They are able to work with optimization software and are familiar with languages used in programming of that software. They get skills in formalization of optimization problems in computer science (such as scheduling of tasks to processors, analysis of network flows), distribution and allocation of resources (transportation problems, travelling salesman problems, etc.), issues from economics, and modelling of conflicts via the game theory. They get an overview of computational complexity of optimization problems. They get orientation in algorithms in linear programming. NI-LSM Statistical Modelling Lab ΚZ 5 The subject is oriented on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is put on the effective use of the available information and its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and analyses of their properties. At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis). NI-LSM2 Statistical Modelling Lab ΚZ 5 The topic of LSM2 is advanced multiple target tracking (MTT). This domain covers simultaneous tracking of multiple targets using radar under the presence of clutter, or video tracking. We aim at the state-of-the-art filters, in particular the PHD (Probability Hypothesis Density) and PMBM (Poisson Multi-Bernoulli) filters. Machine Learning in Practice NI-MLP 5 Applying machine learning methods to real projects in practice involves many other necessary tasks - from understanding the intentions of the client to, ideally, technical implementation. The course guides students through all phases of a project according to the standard CRISP-DM methodology, not only theoretically but also practically. The aim is to experience real data processing and learn how to describe the whole process from exploration to evaluation of the model performance in the form of a clear and understandable report. NI-MOP Modern Object-Oriented Programming in Pharo Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where its ability to natural abstraction is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills of design and implementation of object systems in modern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development needs and areas of interest. In addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work on interesting projects and OO technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvement in the Pharo Consortium. NI-MPL Managerial Psychology ZK 2 Mathematical Structures in Computer Science NI-MSI Mathematical semantics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott model of lambda calculus. Introduction to category theory. NI-MZI Mathematics for data science Z.ZK In this course, students are introduced to those fields of mathematics that are necessary for understanding 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-NMU New media in art and design ZK 3 The course introduces students to the issue of using new media in artistic and design work. Key topics are moving image, internet, computer game and sound. The main goal is to familiarize the student with the largest possible range of creative approaches in new media. The subject emphasizes dialogue with students, especially in lectures devoted to specific art projects. NI-OLI Linux Drivers The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining powerful processors and FPGAs increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development for master's students. The course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience. Efficient Preprocessing and Parameterized Algorithms There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necessary to solve these problems exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one can find a common property (parameter) of the inputs from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponentially in this (small) parameter and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial time preprocessing of the input. which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution method. We will present a

plethora of parameterized algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorithm (presumably) does not exist. We will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes. NI-PDD Data Preprocessing 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-PG1 Computer Grafics 1 7K The course builds on graphic courses (mainly BI-PGA and BI-PGR) and the knowledge from these courses is deepened by state-of-the-art knowledge. The course is designed for those interested in advanced computer graphics. Students will gain practical knowledge with realistic texturing and raytracing methods. An integral part of the course is the study of scientific articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and topics of computer graphics. Public Services Design The course will introduce students to specifics of UX, Service design and development for public sector. We will look into the design and development process from the perspective of suppliers (devs and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration with client representatives. Course is aimed at students-designers as well as clients. Programming in Scala Z,ZK The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language features - e.g.pattern matching and advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and libraries e.g. Play, Cassandra, Scalaz, etc. Advanced Virtual Reality The course introduces advanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D models in Blender, and among other things, it introduces students to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will also deal with creating applications in available 3D engines (mainly Unity3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the knowledge gained in this subject in virtual reality, or directly create a complex game for VR. NI-PVS Advanced embedded systems Z,ZK The course is focused on ARM processors and microcontrollers and their usage in wide range of applications. The course includes a series of advanced topics like security support, working with mass storage devices, motor control, system control and industrial communication. The students obtain both theoretical and also practical experiences with embedded systems. Advanced Python NI-PYT K7 The goal of this course is to learn various advanced techniques and methods in Python. The course indirectly continues where Programming in Python (BI-PYT) left of. The course is very hands-on and it has only tutorials, everything is demonstrated on examples. Classification is based on work in class as well as semestral coursework. The course is lead by external teachers from Red Hat. Z.ZK NI-REV Reverse Engineering 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-ROZ Pattern Recognition 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 NI-RUB Programming in Ruby ΚZ This course is presented in Czech. NI-SCE1 Computer Engineering Seminar Master I Ζ 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 K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. NI-SCE2 Computer Engineering Seminar Master II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. World Economy and Business This course is presented in Czech. However, there is an English variant in the program Informatics (N1801 / 4793). 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 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. Z NI-SZ1 Knowledge Engineering Seminar Master I On this seminar you will present a research paper from a top institute / research group to your peers. You will learn what is being cooked in top research labs around the world. Additionally, you will learn how to properly present and read scientific papers. The work in the seminar will prepare you to attend (and profit from) top machine learning and Al conferences and summer schools, as well as FIT's own Summer Research Program (VvLet), NI-SZ2 Knowledge Engineering Seminar Master II Ζ On this seminar you will present a research paper from a top institute / research group to your peers. You will learn what is being cooked in top research labs around the world. Additionally, you will learn how to properly present and read scientific papers. The work in the seminar will prepare you to attend (and profit from) top machine learning and Al conferences and summer schools, as well as FIT's own Summer Research Program (VyLet). NI-TKA **Category Theory** Z,ZK 4 Theory of Neural Networks In this course, we study neural networks from the point of view of the theory of function approximation and from the point of view of probability theory. At first, we recall basic concepts pertaining to artificial neural Networks, such as neurons and connections between them, types of neurons from the point of view of signal transmission, network topology, somatic and

synaptic mappings, network training, and the role of time in neural networks. In connection with network topology, we get acquainted with its transformation into a canonical topology, and in connection with somatic and synaptic mappings, with their composition into mappings computed by the Network, Finally in connection with training, we pay attention to the problem of overtraining and to the fact that training is actually a specific optimization task, recalling the most typical objective functions and the most important optimization methods employed for neural network training. We will see the meaninig of all these concepts in the context of common kinds of forward neural networks. Within the topic approximation approach to neural networks, we first notice the connection of neural networks to expressing functions of many variables using functions of fewer variables (Kolmogorov theorem, Vituškin theorem). Afterwards, we will see how the universal approximation capacity of neural networks can be mathematically formalized as the sets of mappings computed by neural networks being dense in important Banach spaces of functions, in particular in the spaces of continuous functions, spaces of functions integrable with respect to a finite measure, spaces of functions with continuous derivatives, and Sobolev spaces. Within the topic probabilistic approach, we first get acquainted with training based on expectation and training based on a random sample, and with probabilistic assumptions about training data with which those two kinds of neural networks can be employed. We will see how it is possible to get an estimate of the conditional expectancy of network outputs conditioned by its inputs using the expectancy based learning. We recall the strong and the weak law of large numbers and get acquainted with an analogy of the strong law of large numbers for neural networks and with the assumptions for its validity. Finally, we recall the central limit theorem, get acquinted with its analogy for neural networks, with the assumptions for its validity and with the hypothesis tests based on it. We will see how those tests can be employed to search for the topology of the network. Theoretical Seminar Master I NI-TS1 Ζ 4 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. NI-TS2 Theoretical Seminar Master II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. NI-TS3 Theoretical Seminar Master III 7 Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. NI-TS4 Theoretical Seminar Master IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar. NI-TSP Testing and Reliability 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. Virtual Reality Technology Students will be introduced to the basic concepts of virtual reality. Techniques for displaying virtual worlds (CAVE, HMD, ...) and the possibilities of controlling virtual avatars (position tracking, hand tracking, eye tracking) will be discussed. Furthermore, the concepts of mixed and augmented reality will be introduced. Finally, ways of using virtual and augmented reality will be presented. NI-VCC Virtualization and Cloud Computing Z.ZK Students will gain knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and organizations. They will get acquainted with virtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficiently operate and optimize the performance parameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effective technology today for the management of complex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in the use of modern integration and development tools (Continuous integration and development). NI-VOL Z.ZK 5 Elections We will cover the basics of (committee) elections and, in general, opinion aggregation. NI-VPR Research Project 5 Student obtains the credits for published scientific outputs. The details are at https://courses.fit.cvut.cz/NI-VPR/en. NI-VYC Z.ZK 4 Computability Classical theory of recursive functions and effective computability. NI-ZS10 Ζ Master internship abroad for 10 credits 10 Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. NI-ZS20 Master internship abroad for 20 credits Ζ 20 Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. NI-ZS30 Master internship abroad for 30 credits The course is prezented in chzech language. Each student can once within his / her master's degree have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses MI-ZS10, MI-ZS20, MI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line. 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 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 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 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. Introduction to Discrete and Computational Geometry Z,ZK 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. Efficient Text Pattern Matching NIE-EVY 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. History of Mathematics and Informatics 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 Side-Channel Analysis in Hardware 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 **Data Compression** NIF-KOD 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. NIE-MVI Computational Intelligence Methods 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. Parameterized Algorithms There are many optimization problems for which no polynomial time algorithms are known (e.g. NP-complete problems). Despite that it is often necessary to solve these problems exactly in practice. We will demonstrate that many problems can be solved much more effectively than by naively trying all possible solutions. Often one can find a common property (parameter) of the inputs from practice-e.g., all solutions are relatively small. Parameterized algorithms exploit that by limiting the time complexity exponentially in this (small) parameter and polynomially in the input size (which can be huge). Parameterized algorithms also represent a way to formalize the notion of effective polynomial time preprocessing of the input, which is not possible in the classical complexity. Such a polynomial time preprocessing is then a suitable first step, whatever is the subsequent solution method. We will present a plethora of parameterized algorithm design methods and we will also show how to prove that for some problem (and parameter) such an algorithm (presumably) does not exist. We will also not miss out the relations to other approaches to hard problems such as moderately exponential algorithms or approximation schemes NIE-PDL Practical Deep Learning This course is designed to provide students with a comprehensive understanding of Deep Learning using PyTorch, a popular open-source machine learning 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-PML Personalized Machine Learning Z,ZK 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. Pattern Recognition NIF-ROZ 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 The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. NIE-SCE2 Computer Engineering Seminar Master II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. Semantic Web and Knowledge Graphs NIF-SWF 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 properties are supported by the contract of the con | arious variants and | applications |
| | of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing. | | |
| NIE-VPR | Research Project | Z | 5 |
| 1. At the beginnin | g of the semester, a student reserves her/his final thesis topic and gets together with its supervisor. Together they decide on partial ta | sks that should be | e carried out |
| • | ter. If the requirements they agreed upon are met, the supervisor awards the student an assessment for the course MI-MPR at the er | | |
| , | T) supervisor fills his/her assessment into the paper "Form to award assessment by an external Final theses (FT) supervisor" (for the | | |
| | ts, then, ensure that the assessment is registered into the information system (IS) by asking their internal FT opponent to award the a | | |
| | f the external MT supervisor. In the case the FT opponent is external as well, the assessment will be registered to the IS by the head | • | • |
| for the topic of the | e MT. 3. If the FT topic that the student has reserved is rather general, the immediate tasks the supervisor assigns to the student for the | ne upcoming seme | ester should |
| | aim at fine-tuning the FT topic so that the FTT will be complete and approvable at the end of the semester. | | |
| NIE-VYC | Computability | Z,ZK | 4 |
| | Classical theory of recursive functions and effective computability. | | |
| PI-SCN | Seminars on Digital Design | ZK | 4 |
| • | s with problems of realization and implementation of digital circuits - both combinational and sequential. Basic means of description of | • | • |
| | optimization algorithms are described. Basics of EDA (Electronic Design Automation) systems are given, together with combinatorial | | 1 |
| TV1 | Physical Education | Z | 0 |
| TV2 | Physical Education | Z | 0 |
| TV2K1 | Physical Education 2 | Z | 1 |
| TVKLV | Physical Education Course | Z | 0 |
| TVV | Physical education | Z | 0 |
| TVV0 | Physical education | Z | 0 |
| UKCJ7 | Czech Language 7 for Ukrainian refugees | ZK | 10 |
| | Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Tim | e, Family. | 1 |
| UKCJP | Czech language for advanced | Z,ZK | 2 |
| , | An advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with valid | dity for CTU. | |
| UKMAT | Mathematics UK | Z,ZK | 5 |
| LUZD DIZM | Preparatory Mathematics for Ukrainian refugees | 7 | 5 |
| UKR-PKM | r reparatory mathematics for obtaining rerugees | _ | |

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