

Study plan

Name of study plan: Aplikace softwarového inženýrství

Faculty/Institute/Others:

Department: Department of Software Engineering

Branch of study guaranteed by the department: Applications of Software Engineering

Garantor of the study branch: doc. Ing. Miroslav Virius, CSc.

Program of study: Applications of Natural Sciences

Type of study: Follow-up master full-time

Required credits: 105

Elective courses credits: 15

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 105

The role of the block: PO

Code of the group: NMSASIPP1

Name of the group: NMSASI - povinné předměty 1. ročník

Requirement credits in the group: In this group you have to gain at least 54 credits

Requirement courses in the group: In this group you have to complete at least 13 courses

Credits in the group: 54

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
18AEK	Applied Econometrics and Time Series Theory <i>Jana Sekničková Jana Sekničková</i>	Z,ZK	4	2+2	Z	PO
18FULS	Fulltext Systems <i>Tomáš Liška</i>	KZ	4	2+2	L	PO
18MMC	Monte Carlo Method <i>Miroslav Virius</i>	Z	4	2+2	Z	PO
18MUML	Modeling in UML <i>Vojtěch Merunka</i>	Z,ZK	4	2+2	L	PO
18MEK	Models and Methods for Economic Decisions <i>Petr Fiala Petr Fiala</i>	Z,ZK	5	2+2	Z	PO
18OOP	Object Oriented Programming <i>Miroslav Virius Miroslav Virius</i>	Z	2	0+2	Z	PO
01PNM	Advanced Numerical Methods <i>Michal Beneš Michal Beneš (Gar.)</i>	KZ	2	2+0	L	PO
18AST	Probability and Applied Statistics <i>Jana Sekničková</i>	Z,ZK	3	1+1	Z	PO
18REK	Project Management of Economic Systems <i>Petr Fiala</i>	Z,ZK	4	2+2	L	PO
18SOFC	Soft Computing <i>Jaromír Kukal, Quang Van Tran Jaromír Kukal</i>	KZ	4	2+2	Z	PO
18SWI	Software Engineering <i>Vojtěch Merunka</i>	KZ	4	2+2	Z	PO
18VUSE1	Research Project 1 <i>Jana Sekničková, Miroslav Virius, Jaromír Kukal, Vladimír Jarý, Martin Bodlák Jana Sekničková</i>	Z	6	0+6	Z	PO
18VUSE2	Research Project 2 <i>Miroslav Virius, Jaromír Kukal, Vladimír Jarý, Dana Majerová Jana Sekničková Miroslav Virius (Gar.)</i>	KZ	8	0+8	L	PO

Characteristics of the courses of this group of Study Plan: Code=NMSASIPP1 Name=NMSASI - povinné předměty 1. ročník

18AEK	Applied Econometrics and Time Series Theory	Z,ZK	4
The lectures consist of comments on econometric methods with emphasis on sets of simultaneous linear equations econometric models, time series and vector autoregressive models in economic diagnostics, analysis and forecasting and optimization of economic policy. Case studies and illustrative examples are solved during the practice lessons.			
18FULS	Fulltext Systems	KZ	4
The Fulltext Systems covers methods, algorithms for free text processing including searching and compression methods.			

18MMC	Monte Carlo Method This course is devoted to the numerical method Monte Carlo and to its selected applications.	Z	4
18MUML	Modeling in UML Unified modelling language (UML) is explained from the perspective of the theoretical background of the object-oriented programming and modelling using lambda-calculus. In semester projects and practical examples, instance-level modeling approach is stressed. This course also brings an introduction into the technology of object-oriented databases and object-oriented data structure querying as the essential tool of modeled system verification and validation.	Z,ZK	4
18MEK	Models and Methods for Economic Decisions The aim of the teaching course is to introduce students to basic models and methods of decision theory. Models are structured according number of participants, number of criteria, sets of decision variants, and other attributes. Included basic disciplines are decision by certainty, risk and uncertainty, multicriteria decision-making, and group decision-making.	Z,ZK	5
18OOP	Object Oriented Programming This course consists of the contributions of students concerning given topics concerned on technologies used in program development.	Z	2
01PNM	Advanced Numerical Methods The course is devoted to advanced numerical solution of boundary-value problems and initial-boundary-value problems for ordinary and partial differential equations. It explains the shooting method, advanced finite-difference methods and finite-volume method for nonlinear elliptic, parabolic and first-order hyperbolic partial differential equations.	KZ	2
18AST	Probability and Applied Statistics The lecture links to previous analogue courses with significant emphasis of relationship between mathematical models and practical application and warrant of inevitability of this relationship	Z,ZK	3
18REK	Project Management of Economic Systems The aim of the teaching course is to introduce students to basic techniques of project management. Project is used as a standard instrument for result achievement within given time period, given budget and disposable resources. During lessons students will be introduced to using of Microsoft Project.	Z,ZK	4
18SOFC	Soft Computing Fuzzy systems and selected artificial neural networks are discussed as special cases of Lipschitz continuous functions with constrained sensitivity and limited output. Both theories and application conventions are included.	KZ	4
18SWI	Software Engineering The course explains essential software engineering techniques of the complex software system building using object-oriented programming. The software development process is explained as an integration of system development, software quality assurance, and software project management using miscellaneous techniques. Moreover, programming language Smalltalk is used as a demonstration tool for explained tools and techniques.	KZ	4
18VUUSE1	Research Project 1	Z	6
18VUUSE2	Research Project 2	KZ	8

Code of the group: NMSASIPP2

Name of the group: NMSASI - povinné předměty 2. ročník

Requirement credits in the group: In this group you have to gain at least 51 credits

Requirement courses in the group: In this group you have to complete at least 9 courses

Credits in the group: 51

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
18DPSE1	Master Thesis 1 Jana Sekničková, Miroslav Víríus, Jaromír Kukul, Quang Van Tran, Vladimír Jarý, Martin Bodlák, Dana Majerová, Michal Moc Jana Sekničková	Z	10	0+10	Z	PO
18DPSE2	Master Thesis 2 Jana Sekničková, Tomáš Liška, Miroslav Víríus, Jaromír Kukul, Quang Van Tran, Vladimír Jarý, Martin Bodlák, Dana Majerová, Michal Moc, Jana Sekničková	Z	20	0+20	L	PO
18HEUR	Heuristic Algorithms Jaromír Kukul, Matej Mojzeš	KZ	4	2+2	L	PO
18MOPR	Modeling of Production Systems in Economy Adam Borovička Adam Borovička	Z,ZK	5	2+2	Z	PO
18SDI1	Diploma Seminar 1 Miroslav Víríus Miroslav Víríus	Z	2	0+2	Z	PO
18SDI2	Diploma Seminar 2 Miroslav Víríus Miroslav Víríus	Z	3	0+2	L	PO
18SROZ	Statistical Pattern Recognition and Decision Making Methods Jaromír Kukul Dana Majerová	ZK	3	2+0	Z	PO
01VAMB	Variational Methods B Michal Beneš Michal Beneš (Gar.)	KZ	2	2	Z	PO
18ZTI	Background of Information Theory Jaromír Kukul	KZ	2	2+0	L	PO

Characteristics of the courses of this group of Study Plan: Code=NMSASIPP2 Name=NMSASI - povinné předměty 2. ročník

18DPSE1	Master Thesis 1	Z	10
18DPSE2	Master Thesis 2	Z	20
18HEUR	Heuristic Algorithms Heuristic algorithms of optimization operates on discrete or continuous domains. Brutal force, stochastic, greedy, physically, biologically and sociologically motivated heuristic are included, used for optimum finding and compared.	KZ	4

18MOPR	Modeling of Production Systems in Economy	Z,ZK	5
The aim of the teaching course is to introduce students to basic models and methods for analysis and optimization of production systems. Models are oriented on design, operation, measurement and improvement phases of production systems. Models and analyses of supply chains are considered also. Model formulations are based on integer programming a graph theory. Optimization and heuristic approaches are used for solutions.			
18SDI1	Diploma Seminar 1	Z	2
Seminar devoted to preparation of the diploma thesis and the presentation of the result. Students present their running results.			
18SDI2	Diploma Seminar 2	Z	3
Seminary devoted to preparation of the diploma thesis and the presentation of the results. Students present their running results.			
18SROZ	Statistical Pattern Recognition and Decision Making Methods	ZK	3
The course is devoted to the pattern recognition and decision-making methods which work with statistical data. Applications in economy and other areas are presented.			
01VAMB	Variational Methods B	KZ	2
The course is devoted to the methods of classical variational calculus - functional extrema by Euler equations, second functional derivative, convexity or monotonicity. Further, it contains investigation of quadratic functional, generalized solution, Sobolev spaces and variational problem for elliptic PDE's.			
18ZTI	Background of Information Theory	KZ	2
Entropy as a measure of uncertainty and its use to measure the amount of information. Possibilities of use of information access in various fields of science, engineering economics, etc. to solve specific problems.			

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

Code of the group: NMSASIVP

Name of the group: NMSASI - volitelné předměty

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
18AMTL	Matlab Applications Jaromír Kukul	KZ	4	2+2	L	v
18SQL	SQL Applications Jaromír Kukul Jaromír Kukul	Z	2	0+2	Z	v
18BI	Business Intelligence Matej Mojžeš Matej Mojžeš	KZ	2	1+1	Z	v
18DWH	Data Warehouse Systems, Big Data Processing Tomáš Liška, Kamil Barbierik	ZK	4	2+2	L	v
18DATS	Database System Decomposition Jaromír Kukul	KZ	4	2+2	L	v
01DYRO	Dynamic Decision Making Miroslav Kárný	ZK	4	3+1		v
01DRO1	Dynamic Decision Making 1 Miroslav Kárný, Tatjana Gaj Tatjana Gaj Miroslav Kárný (Gar.)	ZK	2	2+0		v
01FIMA	Financial and Insurance Mathematics Jan Hora Jan Hora (Gar.)	ZK	2	2	Z	v
01JAA	Languages and Automata	ZK	2	2+0	L	v
01JAVY	Languages, Automata and Computability Petr Ambrož Petr Ambrož Petr Ambrož (Gar.)	Z,ZK	5	3+1		v
01JAV	Languages, automata, and computability Petr Ambrož	Z,ZK	4	3+1		v
01MRM	Methods for Sparse Matrices Jiří Mikyška Jiří Mikyška (Gar.)	ZK	2	2+0	L	v
18MRSS	Modeling and Control of Continuous Systems Jaromír Kukul Jaromír Kukul	KZ	4	2+2	Z	v
01SMF	Modern Trends in Corporate Information Technologies Tomáš Oberhuber Tomáš Oberhuber (Gar.)	Z	2	2	L	v
01NELI	Nonlinear Programming Radek Fučík Radek Fučík (Gar.)	ZK	4	3+0	Z	v
01PAA	Parallel Algorithms and Architectures Tomáš Oberhuber Tomáš Oberhuber (Gar.)	KZ	4	3	L	v
18UIA2	Advanced Algorithms 2 Vladimír Jarý Vladimír Jarý	Z	2	1+1	L	v
01PNLA	Advanced Methods of Numerical Linear Algebra Jiří Mikyška Tomáš Oberhuber Jiří Mikyška (Gar.)	ZK	3	2+0	Z	v
18PCP	Advanced C++ Miroslav Vírúš Miroslav Vírúš	Z,ZK	4	2+2		v
01PMU	Probabilistic Learning Models František Hakl František Hakl (Gar.)	ZK	2	2+0	Z	v

18NET	Programming for the .NET Framework <i>Miroslav Virius Miroslav Virius</i>	Z,ZK	2	1+1	Z	v
01PMF	Mainframe Programming <i>Tomáš Oberhuber Tomáš Oberhuber (Gar.)</i>	Z	2	2	L	v
18PVS	Industrial Software Development <i>Miroslav Virius, Jan Doubek Jan Doubek</i>	Z	2	1+1	Z	v
01SWPR1	Software Project 1	Z	2	0+2		v
01SWPR2	Software Project 2	Z	2	0+2		v
18TFT	Financial Markets Theory <i>Quang Van Tran Quang Van Tran Quang Van Tran (Gar.)</i>	KZ	4	2+2	Z	v
01NAH	Theory of Random Processes <i>Jan Vybíral Jan Vybíral (Gar.)</i>	ZK	3	3+0	Z	v
01TSLO	Complexity Theory <i>Vladan Majerech Vladan Majerech (Gar.)</i>	ZK	3	3+0	Z	v
01TC	Number Theory <i>Zuzana Masáková Zuzana Masáková (Gar.)</i>	ZK	4	2+0	L	v
18DTJ	Design of Domain Specific Languages <i>Josef Smolka</i>	Z	2	1+1	Z	v
18DSJ	Design of Domain Specific Languages <i>Josef Smolka Josef Smolka</i>	KZ	2	1+1		v
01ROZ1	Image Processing and Pattern Recognition 1 <i>Barbara Zitová Barbara Zitová (Gar.)</i>	ZK	4	2+2	L	v
18ZDFT	Financial Markets Data Processing <i>Quang Van Tran Quang Van Tran Quang Van Tran (Gar.)</i>	KZ	4	2+2	L	v
01ZPB1	Introduction to Computer Security 1 <i>Petr Vokáč Petr Vokáč Petr Vokáč (Gar.)</i>	Z	2	1+1		v
01ZPB2	Introduction to Computer Security 2 <i>Petr Vokáč Petr Vokáč Petr Vokáč (Gar.)</i>	Z	2	1+1		v
18ZPS	Primer of Computer Simulations <i>Jaromír Kukal</i>	Z	4	2+2	L	v
01ZTG	Introduction to Graph Theory <i>Petr Ambrož Petr Ambrož Petr Ambrož (Gar.)</i>	ZK	4	4+0		v
01UMF	Introduction to Mainframe <i>Tomáš Oberhuber Tomáš Oberhuber Tomáš Oberhuber (Gar.)</i>	Z	2	2	Z	v
12UM	Introduction to Management <i>Petr Malát Petr Malát (Gar.)</i>	ZK	2	2+0	Z	v
18UIA1	Introduction to Advanced Algorithms <i>Vladimír Jarý Vladimír Jarý</i>	Z	2	1+1	Z	v
18RFP	Resolution of Physical Issues <i>Jiří Konfršt</i>	KZ	3	1+2	L	v
18RDS	Control of Discrete Systems <i>Jaromír Kukal</i>	KZ	4	2+2	L	v

Characteristics of the courses of this group of Study Plan: Code=NMSASIVP Name=NMSASI - volitelné předměty

18AMTL	Matlab Applications	KZ	4
Systematic application of Matlab optimization toolbox for the solution of linear, quadratic, binary, integer and nonlinear programming tasks. Simulation of chaotic systems and fractal set generation. Analysis of trajectories, attractors and fractal sets including estimation of their properties.			
18SQL	SQL Applications	Z	2
Practical realization of database system according to general principles of database analysis.			
18BI	Business Intelligence	KZ	2
The aim of the subject is to explain to the students different characteristics of production and analytical databases and a set of processes, know-how and tools (not only) to support decision-making activities within the organization. In addition to the basic concept of BI, listeners will get acquainted with the general methodology of implementation of custom algorithms derived from other theories and subjects into the BI environment.			
18DWH	Data Warehouse Systems, Big Data Processing	ZK	4
The data warehouse architecture, implementation, methods for extraction of the data from various sources, transformation procedures and loading as well as data processing, archiving, data searching and evaluating are deeply studied in these lectures.			
18DATS	Database System Decomposition	KZ	4
The lectures are oriented to basic terms, database objects, their properties and relationships together with the accent to logics of decomposition and applications of database operations.			
01DYRO	Dynamic Decision Making	ZK	4
01DRO1	Dynamic Decision Making 1	ZK	2
1. An abstraction of real decision-making problems 2. Decision-making elements (decision maker, its environment, behaviour of the closed decision loop, strategy, constraints) 3. Quantification of the decision-making task (harmonised quantitative modelling of preferences among behaviours and strategies) 4. A final formalised decision-making task and its elements (probabilistic models and performance index) 5. Fully probabilistic design as the optimisation of a universal expected performance index. 6. Tools for solving of dynamic decision-making task (dynamic programming, its additive and data-driven versions) 7. General tools for constructing decision-making elements			
01FIMA	Financial and Insurance Mathematics	ZK	2
This course is an introduction to the problems of life and non-life insurance and financial mathematics.			
01JAA	Languages and Automata	ZK	2
Various types of generative grammars and corresponding automata. Closure and algorithmic problems.			
01JAVY	Languages, Automata and Computability	Z,ZK	5
Finite automata and regular languages. Context free languages and pushdown automata. Unrestricted languages and Turing machines. Algorithms and algorithmically enumerable functions. Recursive functions, recursive sets and recursively enumerable sets. Algorithmically unsolvable problems.			
01JAV	Languages, automata, and computability	Z,ZK	4
Finite automata and regular languages. Context free languages and pushdown automata. Unrestricted languages and Turing machines. Algorithms and algorithmically enumerable functions. Recursive functions, recursive sets and recursively enumerable sets. Algorithmically unsolvable problems.			

01MRM	Methods for Sparse Matrices	ZK	2
The course is aimed at utilization of sparse matrices in direct methods for solution of large systems of linear algebraic equations. The course will cover the decomposition theory for symmetric and positive definite matrices. Theoretic results will be further applied for solution of more general systems. Main features of the methods and common implementation issues will be covered.			
18MRSS	Modeling and Control of Continuous Systems	KZ	4
01SMF	Modern Trends in Corporate Information Technologies	Z	2
The course is devoted to mainframe administration basics. After introduction to mainframe hardware the following lectures covers security, transaction systems, virtualization and non-relational databases in the mainframe environment.			
01NELI	Nonlinear Programming	ZK	4
Nonlinear optimization problems find their application in many areas of applied mathematics. The lecture covers the basics of mathematical programming theory with emphasis on convex optimization and basic methods for unconstrained and constrained optimization. The lecture is supplemented by illustrative examples.			
01PAA	Parallel Algorithms and Architectures	KZ	4
This course deals with the parallel data processing. It is important in situations when one processing unit (CPU) is not powerful enough to finish given task in reasonable time. When designing parallel algorithms, good knowledge of the parallel architectures is important. Therefore these architectures are studied as a part of this course too.			
18UIA2	Advanced Algorithms 2	Z	2
The lecture covers selected algorithms of the artificial intelligence and construction of autonomous robot.			
01PNLA	Advanced Methods of Numerical Linear Algebra	ZK	3
Representation of real numbers in computers, behaviour of rounding errors during numerical computations, sensitivity of a problem, numerical stability of an algorithm. We will analyse sensitivity of the eigenvalues of a given matrix and sensitivity of roots of systems of linear algebraic equations. Then, the backward analysis of these problems will be performed. The second part of the course is devoted to the methods of QR-decomposition, least squares problem, and to several modern Krylov subspace methods for the solution of systems of linear algebraic equations and the Lanczos method for approximation of the eigenvalues of a symmetric square matrix.			
18PCP	Advanced C++	Z,ZK	4
This lecture covers the virtual inheritance, variadic templates, template metaprogramming, template libraries design and implementation, tools for data type processing in compile time and for the advanced diagnostic of the templates, application of the multithreading (execution parallelization), treating the locales (localization and internationalization of the software), the tools for advanced mathematical and technical computing and the file system access tools.			
01PMU	Probabilistic Learning Models	ZK	2
Introduction into the theory PAC learning model, VC-dimension of finite sets, Sauer, Cover and Radon's lemma, VC-dimension of composed mappings, application of VC-dimension for lower bound of necessary patterns, analysis of properties of delta rule based learning processes, PAC learning model extensions and PAO learning, Fourier coefficients search for Boolean functions.			
18NET	Programming for the .NET Framework	Z,ZK	2
This course is devoted to the principles of the .NET Framework and to the programming of the common applications for .NET Framework. It is based on the C# programming language.			
01PMF	Mainframe Programming	Z	2
In this course the basics of programming in z/OS are explained namely the programming in assembler. Basic instructions, macros, I/O operations, DLL library loading and some other topics are discussed.			
18PVS	Industrial Software Development	Z	2
General lecture about applied code writing in commercial sphere. All essential programmer skills associated with development of software for industrial purposes will be covered during the lecture. This includes versioning, testing, release handling and also code quality measurement. The simple real world use scenarios introduced in lectures will be deeply examined in examples. The examples will be constructed with emphasis on understanding and reuse of already done third person code.			
01SWPR1	Software Project 1	Z	2
01SWPR2	Software Project 2	Z	2
18TFT	Financial Markets Theory	KZ	4
Since financial instrument prices are unknown in advance to financial market participants, financial derivatives are currently being used as common instruments to eliminate risks arising from price instability of financial assets. The theory of financial markets uses the knowledge of mathematical analysis and statistics to manage the portfolio of risk assets and the valuation of sophisticated financial instruments in the form of derivatives such as swaps, forwards, futures and options.			
01NAH	Theory of Random Processes	ZK	3
The course is devoted in part to the basic notions of the general theory of random processes and partially to the theory of stationary processes and sequences both weakly and strongly stationary ones.			
01TSLO	Complexity Theory	ZK	3
The course is devoted to incorporation of complexity questions during algorithm development, introduction to NP completeness and generally to complexity classes of deterministic or nondeterministic Turing machines bounded by time or space. Emphasis is placed on mutual relations among these classes. Aside from nondeterministic classes we examine probability classes. Class of interactive protocols is presented at the end of lecture course.			
01TC	Number Theory	ZK	4
The subject is devoted to elementary number theory and to fundamentals of transcendental and algebraic theory.			
18DTJ	Design of Domain Specific Languages	Z	2
18DSJ	Design of Domain Specific Languages	KZ	2
01ROZ1	Image Processing and Pattern Recognition 1	ZK	4
An introductory course on image processing and pattern recognition. Major attention is paid to image sampling and quantization, image preprocessing (noise removal, contrast stretching, sharpening, and de-blurring, Wiener filtering, blind deconvolution), edge detection, morphology and geometric transformations and warping. Numerous applications and experimental results are presented in addition to the theory.			
18ZDFT	Financial Markets Data Processing	KZ	4
The course enables students to combine knowledge of numerical methods, Matlab programming and financial mathematics to solve practical problems in finance such as portfolio optimization, risk management and valuation of financial derivatives, especially options of different types. Upon completion of the course the student will be able to formulate and numerically solve concrete problems in the given field and subsequently implement their solutions in practice.			
01ZPB1	Introduction to Computer Security 1	Z	2
01ZPB2	Introduction to Computer Security 2	Z	2
18ZPS	Primer of Computer Simulations	Z	4
01ZTG	Introduction to Graph Theory	ZK	4
01UMF	Introduction to Mainframe	Z	2
In this course we teach the mainframe architecture. We explain how to operate the system z/OS, how to start a job using the JCL and we explain some differences when programming in C/C++ for z/OS:			

12UM	Introduction to Management	ZK	2
Modern management conception, managerial functions, managerial activities . Managerial decision tasks, business strategy. Human resources management, Staff motivation and evaluation, teamwork, labour code. System marketing conception, marketing goals, marketing strategy. Marketing planning and decision making. Marketing mix, product life cycle, publicity campaign.			
18UIA1	Introduction to Advanced Algorithms	Z	2
The lecture covers selected algorithms of the artificial intelligence and their application in the real world.			
18RFP	Resolution of Physical Issues	KZ	3
There are various specific problems having physical background (for example also in forensic medicine or biomechanics) in maybe all technology disciplines and also in majority of natural sciences (related both to living and non-living matter). Their solution is not often easy feasible in analytic way, but it is required from perspective of its understanding and appreciation. Hence this subject is focused at some more complex issues, which solvability is based on acceptable simplification for subsequent possible computer processing regardless it is mathematical, geometrical, material of other conceivable simplification. This subject prefers analytical way of solution, but there is obvious required link to software engineering methods. Software engineering is the only way how to realize the solution. In conclusion, this subject will instruct students, how to transform selected physical issue using both numerical and analytical methods from its insolvable state to a solvable state having acceptable accuracy			
18RDS	Control of Discrete Systems	KZ	4

List of courses of this pass:

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01DRO1	Dynamic Decision Making 1	ZK	2
1. An abstraction of real decision-making problems 2. Decision-making elements (decision maker, its environment, behaviour of the closed decision loop, strategy, constraints) 3. Quantification of the decision-making task (harmonised quantitative modelling of preferences among behaviours and strategies) 4. A final formalised decision-making task and its elements (probabilistic models and performance index) 5. Fully probabilistic design as the optimisation of a universal expected performance index. 6. Tools for solving of dynamic decision-making task (dynamic programming, its additive and data-driven versions) 7. General tools for constructing decision-making elements			
01DYRO	Dynamic Decision Making	ZK	4
01FIMA	Financial and Insurance Mathematics	ZK	2
This course is an introduction to the problems of life and non-life insurance and financial mathematics.			
01JAA	Languages and Automata	ZK	2
Various types of generative grammars and corresponding automata. Closure and algorithmic problems.			
01JAV	Languages, automata, and computability	Z,ZK	4
Finite automata and regular languages. Context free languages and pushdown automata. Unrestricted languages and Turing machines. Algorithms a algorithmically enumerable functions. Recursive functions, recursive sets and recursively enumerable sets. Algorithmically unsolvable problems.			
01JAVY	Languages, Automata and Computability	Z,ZK	5
Finite automata and regular languages. Context free languages and pushdown automata. Unrestricted languages and Turing machines. Algorithms a algorithmically enumerable functions. Recursive functions, recursive sets and recursively enumerable sets. Algorithmically unsolvable problems.			
01MRM	Methods for Sparse Matrices	ZK	2
The course is aimed at utilization of sparse matrices in direct methods for solution of large systems of linear algebraic equations. The course will cover the decomposition theory for symmetric and positive definite matrices. Theoretic results will be further applied for solution of more general systems. Main features of the methods and common implementation issues will be covered.			
01NAH	Theory of Random Processes	ZK	3
The course is devoted in part to the basic notions of the general theory of random processes and partially to the theory of stationary processes and sequences both weakly and strongly stationary ones.			
01NELI	Nonlinear Programming	ZK	4
Nonlinear optimization problems find their application in may areas of applied mathematics. The lecture covers the basics of mathematical programming theory with emphasis on convex optimization and basic methods for unconstrained and constrained optimization. The lecture is supplemented by illustrative examples.			
01PAA	Parallel Algorithms and Architectures	KZ	4
This course deals with the parallel data processing. It is important in situations when one processing unit (CPU) is not powerful enough to finish given task in reasonable time. When designing parallel algorithms, good knowledge of the parallel architectures is important. Therefore these architectures are studied as a part of this course too.			
01PMF	Mainframe Programming	Z	2
In this course the basics of programming in z/OS are explained namely the programming in assembler. Basic instructions, macros, I/O operations, DLL library loading and some other topics are discussed.			
01PMU	Probabilistic Learning Models	ZK	2
Introduction into the theory PAC learning model, VC-dimension of finite sets, Sauer, Cover and Radon's lemma, VC-dimension of composed mappings, application of VC-dimension for lower bound of necessary patterns, analysis of properties of delta rule based learning processes, PAC learning model extensions and PAO learning, Fourier coefficients search for Boolean functions.			
01PNLA	Advanced Methods of Numerical Linear Algebra	ZK	3
Representation of real numbers in computers, behaviour of rounding errors during numerical computations, sensitivity of a problem, numerical stability of an algorithm. We will analyse sensitivity of the eigenvalues of a given matrix and sensitivity of roots of systems of linear algebraic equations. Then, the backward analysis of these problems will be performed. The second part of the course is devoted to the methods of QR-decomposition, least squares problem, and to several modern Krylov subspace methods for the solution of systems of linear algebraic equations and the Lanczos method for approximation of the eigenvalues of a symmetric square matrix.			
01PNM	Advanced Numerical Methods	KZ	2
The course is devoted to advanced numerical solution of boundary-value problems and initial-boundary-value problems for ordinary and partial differential equations. It explains the shooting method, advanced finite-difference methods and finite-volume method for nonlinear elliptic, parabolic and first-order hyperbolic partial differential equations.			
01ROZ1	Image Processing and Pattern Recognition 1	ZK	4
An introductory course on image processing and pattern recognition. Major attention is paid to image sampling and quantization, image preprocessing (noise removal, contrast stretching, sharpening, and de-blurring, Wiener filtering, blind deconvolution), edge detection, morphology and geometric transformations and warping. Numerous applications and experimental results are presented in addition to the theory.			

01SMF	Modern Trends in Corporate Information Technologies	Z	2
The course is devoted to mainframe administration basics. After introduction to mainframe hardware the following lectures covers security, transaction systems, virtualization and non-relational databases in the mainframe environment.			
01SWPR1	Software Project 1	Z	2
01SWPR2	Software Project 2	Z	2
01TC	Number Theory	ZK	4
The subject is devoted to elementary number theory and to fundamentals of transcendental and algebraic theory.			
01TSLO	Complexity Theory	ZK	3
The course is devoted to incorporation of complexity questions during algorithm development, introduction to NP completeness and generally to complexity classes of deterministic or nondeterministic Turing machines bounded by time or space. Emphasis is placed on mutual relations among these classes. Aside from nondeterministic classes we examine probability classes. Class of interactive protocols is presented at the end of lecture course.			
01UMF	Introduction to Mainframe	Z	2
In this course we teach the mainframe architecture. We explain how to operate the system z/OS, how to start a job using the JCL and we explain some differences when programming in C/C++ for z/OS:			
01VAMB	Variational Methods B	KZ	2
The course is devoted to the methods of classical variational calculus - functional extrema by Euler equations, second functional derivative, convexity or monotonicity. Further, it contains investigation of quadratic functional, generalized solution, Sobolev spaces and variational problem for elliptic PDE's.			
01ZPB1	Introduction to Computer Security 1	Z	2
01ZPB2	Introduction to Computer Security 2	Z	2
01ZTG	Introduction to Graph Theory	ZK	4
12UM	Introduction to Management	ZK	2
Modern management conception, managerial functions, managerial activities . Managerial decision tasks, business strategy. Human resources management, Staff motivation and evaluation, teamwork, labour code. System marketing conception, marketing goals, marketing strategy. Marketing planning and decision making. Marketing mix, product life cycle, publicity campaign.			
18AEK	Applied Econometrics and Time Series Theory	Z,ZK	4
The lectures consist of comments on econometric methods with emphasis on sets of simultaneous linear equations econometric models, time series and vector autoregressive models in economic diagnostics, analysis and forecasting and optimization of economic policy. Case studies and illustrative examples are solved during the practice lessons.			
18AMTL	Matlab Applications	KZ	4
Systematic application of Matlab optimization toolbox for the solution of linear, quadratic, binary, integer an nonlinear programming tasks. Simulation of chaotic systems an fractal set generation. Analysis of trajectories, attractors and fractal sets including estimation of their properties.			
18AST	Probability and Applied Statistics	Z,ZK	3
The lecture links to previous analogue courses with significant emphasis of relationship between mathematical models and practical application and warrant of inevitability of this relationship			
18BI	Business Intelligence	KZ	2
The aim of the subject is to explain to the students different characteristics of production and analytical databases and a set of processes, know-how and tools (not only) to support decision-making activities within the organization. In addition to the basic concept of BI, listeners will get acquainted with the general methodology of implementation of custom algorithms derived from other theories and subjects into the BI environment.			
18DATS	Database System Decomposition	KZ	4
The lectures are oriented to basic terms, database objects, their properties and relationships together with the accent to logics of decomposition and applications of database operations.			
18DPSE1	Master Thesis 1	Z	10
18DPSE2	Master Thesis 2	Z	20
18DSJ	Design of Domain Specific Languages	KZ	2
18DTJ	Design of Domain Specific Languages	Z	2
18DWH	Data Warehouse Systems, Big Data Processing	ZK	4
The data warehouse architecture, implementation, methods for extraction of the data from various sources, transformation procedures and loading as well as data processing, archiving, data searching and evaluating are deeply studied in these lectures.			
18FULS	Fulltext Systems	KZ	4
The Fulltext Systems covers methods, algorithms for free text processing including searching and compression methods.			
18HEUR	Heuristic Algorithms	KZ	4
Heuristic algorithms of optimization operates on discrete or continuous domains. Brutal force, stochastic, greedy, physically, biologically and sociologically motivated heuristic are included, used for optimum finding and compared.			
18MEK	Models and Methods for Economic Decisions	Z,ZK	5
The aim of the teaching course is to introduce students to basic models and methods of decision theory. Models are structured according number of participants, number of criteria, sets of decision variants, and other attributes. Included basic disciplines are decision by certainty, risk and uncertainty, multicriteria decision-making, and group decision-making.			
18MMC	Monte Carlo Method	Z	4
This course is devoted to the numerical method Monte Carlo and to its selected applications.			
18MOPR	Modeling of Production Systems in Economy	Z,ZK	5
The aim of the teaching course is to introduce students to basic models and methods for analysis and optimization of production systems. Models are oriented on design, operation, measurement and improvement phases of production systems. Models and analyses of supply chains are considered also. Model formulations are based on integer programming a graph theory. Optimization and heuristic approaches are used for solutions.			
18MRSS	Modeling and Control of Continuous Systems	KZ	4
18MUML	Modeling in UML	Z,ZK	4
Unified modelling language (UML) is explained from the perspective of the theoretical background of the object-oriented programming and modelling using lambda-calculus. In semestral projects and practical examples, instance-level modeling approach is stressed. This course also brings an introduction into the technology of object-oriented databases and object-oriented data structure querying as the essential tool of modeled system verification and validation.			
18NET	Programming for the .NET Framework	Z,ZK	2
This course is devoted to the principles of the .NET Framework and to the programming of the common applications for .NET Framework. It is based on the C# programming language.			
18OOP	Object Oriented Programming	Z	2
This course consists of the contributions of students concerning given topics concerned on technologies used in program development.			

18PCP	Advanced C++	Z,ZK	4
This lecture covers the virtual inheritance, variadic templates, template metaprogramming, template libraries design and implementation, tools for data type processing in compile time and for the advanced diagnostic of the templates, application of the multithreading (execution parallelization), treating the locales (localization and internationalization of the software), the tools for advanced mathematical and technical computing and the file system access tools.			
18PVS	Industrial Software Development	Z	2
General lecture about applied code writing in commercial sphere. All essential programmer skills associated with development of software for industrial purposes will be covered during the lecture. This includes versioning, testing, release handling and also code quality measurement. The simple real world use scenarios introduced in lectures will be deeply examined in examples. The examples will be constructed with emphasis on understanding and reuse of already done third person code.			
18RDS	Control of Discrete Systems	KZ	4
18REK	Project Management of Economic Systems	Z,ZK	4
The aim of the teaching course is to introduce students to basic techniques of project management. Project is used as a standard instrument for result achievement within given time period, given budget and disposable resources. During lessons students will introduced to using of Microsoft Project.			
18RFP	Resolution of Physical Issues	KZ	3
There are various specific problems having physical background (for example also in forensic medicine or biomechanics) in maybe all technology disciplines and also in majority of natural sciences (related both to living and non-living matter). Their solution is not often easy feasible in analytic way, but it is required from perspective of its understanding and appreciation. Hence this subject is focused at some more complex issues, which solvability is based on acceptable simplification for subsequent possible computer processing regardless it is mathematical, geometrical, material of other conceivable simplification. This subject prefers analytical way of solution, but there is obvious required link to software engineering methods. Software engineering is the only way how to realize the solution. In conclusion, this subject will instruct students, how to transform selected physical issue using both numerical and analytical methods from its insolvable state to a solvable state having acceptable accuracy			
18SDI1	Diploma Seminar 1	Z	2
Seminar devoted to preparation of the diploma thesis and the presentation of the result. Students present their running results.			
18SDI2	Diploma Seminar 2	Z	3
Seminary devoted to preparation of the diploma thesis and the presentation of the results. Students present their running results.			
18SOFC	Soft Computing	KZ	4
Fuzzy systems and selected artificial neural networks are discussed as special cases of Lipschitz continuous functions with constrained sensitivity and limited output. Both theories and application conventions are included.			
18SQL	SQL Applications	Z	2
Practical realization of database system according to general principles of database analysis.			
18SROZ	Statistical Pattern Recognition and Decision Making Methods	ZK	3
The course is devoted to the pattern recognition and decision-making methods which work with statistical data. Applications in economy and other areas are presented.			
18SWI	Software Engineering	KZ	4
The course explains essential software engineering techniques of the complex software system building using object-oriented programming. The software development process is explained as an integration of system development, software quality assurance, and software project management using miscellaneous techniques. Moreover, programming language Smalltalk is used as a demonstration tool for explained tools and techniques.			
18TFT	Financial Markets Theory	KZ	4
Since financial instrument prices are unknown in advance to financial market participants, financial derivatives are currently being used as common instruments to eliminate risks arising from price instability of financial assets. The theory of financial markets uses the knowledge of mathematical analysis and statistics to manage the portfolio of risk assets and the valuation of sophisticated financial instruments in the form of derivatives such as swaps, forwards, futures and options.			
18UIA1	Introduction to Advanced Algorithms	Z	2
The lecture covers selected algorithms of the artificial intelligence and their application in the real world.			
18UIA2	Advanced Algorithms 2	Z	2
The lecture covers selected algorithms of the artificial intelligence and construction of autonomous robot.			
18VUSE1	Research Project 1	Z	6
18VUSE2	Research Project 2	KZ	8
18ZDFT	Financial Markets Data Processing	KZ	4
The course enables students to combine knowledge of numerical methods, Matlab programming and financial mathematics to solve practical problems in finance such as portfolio optimization, risk management and valuation of financial derivatives, especially options of different types. Upon completion of the course the student will be able to formulate and numerically solve concrete problems in the given field and subsequently implement their solutions in practice.			
18ZPS	Primer of Computer Simulations	Z	4
18ZTI	Background of Information Theory	KZ	2
Entropy as a measure of uncertainty and its use to measure the amount of information. Possibilities of use of information access in various fields of science, engineering economics, etc. to solve specific problems.			

For updated information see <http://bilakniha.cvut.cz/en/FF.html>

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