Course descriptions

TABLE OF CONTENTS

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-274/18	Advanced Complexity Theory

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
homework
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will familiarize themselves with important complexity classes, corresponding complete problems, and relations among the classes, and with open problems in the field. They will understand the relations among computational models (Turing machines, RAM, boolean circuits) and resources (time, memory, alternation, randomness, parallelism).

Class syllabus:
Alternation, polynomial hierarchy, #P, PSPACE; Boolean circuits and lower bounds; Interactive protocols and probabilistically checkable proofs; Hardness amplification and derandomization; complexity of some decidable theories

Recommended literature:
Arora, Barak – Computational Complexity: A Modern Approach
Kozen – Theory of Computation

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
50,0	0,0	16,67	16,67	0,0	16,67

Lecturers: Mgr. Jakub Kováč, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-267/15	Advanced Efficient Algorithms

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-310 (recommended)

Course requirements:
ongoing evaluation, exam
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students learn to use some advanced techniques used in design and implementation of efficient algorithms.

Class syllabus:
The content is mostly focused in methods and techniques of efficient exact sequential solutions of algorithmic problems. Some of the topics include: Number theoretic algorithms; Efficient graph algorithms; Techniques for optimization of dynamic programming; Efficient implementation of algorithms

Recommended literature:
Introduction to algorithms / Thomas H. Cormen ... [et al.]. Cambridge, Mass. : MIT Press, 2001
Algorithms / Robert Sedgewick; Kevin Daniel Wayne. Upper Saddle River, NJ : Addison-Wesley, 2011; Algorithm Design : Pearson New International Edition / Jon Kleinberg, Ă‰va Tardos. Harlow : Pearson education limited, 2013; selected papers from the field

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 91

A	B	C	D	E	FX
60,44	14,29	14,29	6,59	3,3	1,1

Lecturers: RNDr. Michal Foríšek, PhD.
Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-112/15	Advanced Image Processing

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
It is necessary to obtain at least 90% of the points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% to grade D and at least 50% to grade E.
The course assessment consists of three parts: exercises (30%), project (20%) and final exam (50%). Students should get at least 30 points (out of 50) from exercises and project to meet the minimum condition for admission to the final written exam.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Graduates will know the advanced image processing techniques, such as image transformation, filtering, image improvement, advanced segmentation techniques (using active contours - snakes, flood segmentation) etc.

Class syllabus:
Image capture.
Features digital image.
Picture transformation
Methods of image preprocessing, Hough transform
Fourier Transform - DFT, FFT, filters detail
noise Reduction
Mathematical Morphology BW and grayscale
Segmentation. Snake watershed, clustering
improving the image
processing textures

Recommended literature:
Computer Vision: Algorithms and Applications, Richard Szeliski, The University of Washington, 2nd ed. 2021
Image processing, analysis, and machine vision / Milan Sonka, Vaclav Hlavac, Roger Boyle. [Stamford] : Cengage Learning, 2008

Digital image processing / Rafael C. Gonzalez, Richard E. Woods. Beijing : PEARSON; 4th edition, 2018
Image processing : The fundamentals / Maria Petrou, Costas Petrou. Chichester : John Wiley, 2010

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 74

A	B	C	D	E	FX
12,16	22,97	29,73	13,51	5,41	16,22

Lecturers: RNDr. Zuzana Černeková, PhD., Mgr. Dana Škorvánková

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-266/15	Advanced Linux Administration

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-INF-176 (recommended)

Course requirements:
Practical assignments
Approximate grading scale: A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course the students will be able to carry out advanced Linux system administration tasks.

Class syllabus:
Advanced user accounts admnistration (PAM, LDAP, Kerberos), disk redundancy (RAID), advanced volume management (LVM), disk encryption, advanced security technologies (capabilities, SELinux), advanced network configuration (firewall, bridge, policy routing).

Recommended literature:
Lecturer's own electronic texts published on the course's web page, freely accessible electronic information sources.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 36

A	B	C	D	E	FX
69,44	19,44	5,56	2,78	0,0	2,78

Lecturers: RNDr. Jaroslav Janáček, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/2-INF-182/15	Algebra (3)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-115 Algebra (1) and 1-INF-156 Algebra (2)

Course requirements:
Individual work, test, final exam
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students will be familiar with the most important concepts, results, methods and algorithms of linear algebra (for example computing canonical forms of matrices and other invariants with respect to congruency and similarity) with connections to geometry, computer graphics and computer science. Students will be able to actively use this knowledge in other disciplines.

Class syllabus:
Scalar product, orthonormal basis and orthogonal projection to a subspace. Quadratic forms and their canonical forms. Positive (semi-)definite matrices and quadratic forms and criteria for verifying definiteness. Change of basis, similar matrices. Similarity to a diagonal matrix. Eigenvalues and eigenvectors, characteristic polynomial. Orthogonal matrices, orthogonal similarity, Schur theorem, principal axes theorem. Symmetrical polynomials. Use of Fast Fourier transform for multiplication of large integers. PageRank algorithm.

Recommended literature:
Algebra a teoretická aritmetika 1 / Tibor Katriňák ... [et al.]. Bratislava : Univerzita Komenského, 2002
Lineárna algebra a geometria : Cesta z troch rozmerov s presahmi do príbuzných odborov / Pavol Zlatoš. Bratislava : Albert Marenčin, 2011
Electronic course notes published at the course web page

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 76

A	B	C	D	E	FX
48,68	19,74	9,21	7,89	11,84	2,63

Lecturers: RNDr. Martin Sleziak, PhD., doc. RNDr. Jaroslav Guričan, CSc.

Last change: 15.01.2018

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-278/18	Analytic and Enumerative Combinatorics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
2-INF-277/18 Complex Analysis for Computer Scientists or 1-MAT-416/15 Theory of Complex Variable Functions

Course requirements:
homework assignments, written and oral exam
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will understand the key methods of analytic combinatorics and will be able to apply their theoretical knowledge on the fields of combinatorial enumeration and algorithm analysis. They will also get acquainted with selected techniques and results of classical enumerative combinatorics.

Class syllabus:
The algebra of formal power series. Unlabelled and labelled combinatorial structures, ordinary and exponential generating functions, the symbolic method and its connection to formal languages. Generating functions as analytical objects, their singularities, Pringsheim's theorem. Singularity analysis and its applications. Coefficients of rational, meromorphic, and algebraic functions. The saddle-point method and its applications. Multivariate analytic combinatorics. Selected topics in classical enumerative combinatorics: Cayley's formula, Möbius inversion over locally finite posets, Pólya's theory.

Recommended literature:
Electronic materials on the course website.
Analytic Combinatorics / Philippe Flajolet, Robert Sedgewick. Cambridge : Cambridge University Press, 2009
Notes on Counting: An Introduction to Enumerative Combinatorics / Peter J. Cameron. Cambridge : Cambridge University Press, 2017
Analytic Combinatorics: A Multidimensional Approach / Marni Mishna. Boca Raton : CRC Press, 2019
Algorithmic and Symbolic Combinatorics / Stephen Melczer. Cham : Springer, 2021

Analytic Combinatorics in Several Variables / Robin Pemantle, Mark C. Wilson. New York : Cambridge University Press, 2013
Introductory Combinatorics, 5th ed. / Richard A. Brualdi. Upper Saddle River : Pearson, 2010
Kapitoly z diskrétní matematiky, 3rd ed. / Jiří Matoušek, Jaroslav Nešetřil. Prague : Karolinum, 2007
Algebraic Combinatorics, 2nd ed. / Richard P. Stanley. Cham : Springer, 2018
Discrete Calculus: Methods for Counting / Carlo Mariconda, Alberto Tonolo. Cham : Springer, 2016

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-253/15	Answer Set Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites: FMFI.KAI/2-AIN-108/15 - Computational Logic

Antirequisites: FMFI.KAI/1-AIN-617/00

Course requirements:
Continuous assessment: project, homework, paper
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to use Logic Programming and a special ASP approach to solve various problems and understand their theoretical assumptions.

Class syllabus:
Logic program, stable models, non-monotony, explicit negation, boundaries, ASP approach to problem solving, planning and diagnostics, preferences

Recommended literature:
Knowledge representation reasoning and declarative problem solving / Chitta Baral. Cambridge : Cambridge University Press, 2003
Inteligencia ako výpočet / Ján Šefránek. Bratislava : Iris, 2000

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

A	B	C	D	E	FX
66,67	0,0	33,33	0,0	0,0	0,0

Lecturers: Ing. Alexander Šimko, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-221/15	Approximation of Optimisation Problems

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: homeworks and/or project
Exam: written and optionally oral
Scale of assessment (preliminary/final): 10/90

Learning outcomes:
Students are familiar with the notion of optimization problems, and can formulate them in various notations, including integer, linear and semidefinite programming. They know basic methods and notions of combinatorial optimization (simplex algorithm, duality theory), and can actively employ various techniques (e.g. partitioning, rounding, derandomization, primal-dual methods) in order to design algorithms with guaranteed approximation ratio. They know the basic classes of the complexity of approximation (APX, PTAS, FPTAS), and general methods to prove inapproximability results (use of PCP theorem, reductions, completeness). They are acquainted with the basic results for selected concrete problems (e.g. TSP, variants of Cut).

Class syllabus:
Optimization problems and their complexity classes, techniques for design of approximation algorithms, foundations of linear and semi-definite programming, non-approximability results, approximability of selected problems

Recommended literature:
Complexity and approximation : Combinatorial optimization problems and their approximability properties / G. Ausiello ... [et al.]. Berlin : Springer, 1999
Approximation algorithms / Vijay V. Vazirani. Berlin : Springer, 2001
Algorithmics for hard problems : Introduction to combinatorial optimization, randomization, approximation, and heuristics / Juraj Hromkovič. Berlin : Springer, 2003
Understanding and using linear programming / Jiří Matoušek, Bernard Gärtner. Berlin : Springer, 2007
Combinatorial optimization : Algorithms and complexity / Christos H. Papadimitriou, Kenneth Steiglitz. Englewood Cliffs : Prentice-Hall, 1998

The design of approximation algorithms / David P. Williamson, David B. Shmoys. New York : Cambridge University Press, 2011

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
34,44	11,11	18,89	7,78	10,0	17,78

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-137/15	Artificial Intelligence

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-AINa-137/20

Course requirements:
projects, written exam
Scale: A 95%, B 88%, C 79%, D 68%, E 55%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students should have a good overview of the theoretical methods used in artificial intelligence. They should be able to use these methods in practice in programming intelligent systems, they should be able to enrich and creatively exploit.

Class syllabus:
1. Short repetition of basic technics in AI: agent, searching, CSP problem, logical agents.
2. Planning I: Basic planning (STRIPS, POP, TOP, graphplan, critical path method), scheduling.
3. Planning II: Planning problems (hierarchical planning, senzorless planning, incremental planning, planning in a case of nondeterministic actions.)
4. Probabilistic methods in UI I: necessary basic concepts (short summary), introduction to Monte Carlo methods, basic examples. Sampling methods in MC, MC in AI (sampling and artificial data, Monte Carlo tree search)
5. Probabilistic methods in UI II: bayesian networks, bayesian inference, examples. Exact and probabilistic inference in bayesian networks: derect and rejection sampling, likehood weighting, how to use bayesian networks in UI (classification, diagnosis)
6. Time series I . Classical time series analysis, trend and periodicity analysis, spectral analysis, stationary time series, nonlinear time series.
7. Time series II. Box Jenkins time series analysis (AR, MA, ARMA models), time series with uncertainity, introduction.
8. Time series III. Time series with uncertainity, markovian processes, filtration, prediction, Vitterbi algorithm, real problem examples, Kálman filter.
9. Decision theory I. Introduction, simple and complex decisions (lottery examples) utility functions. Markov decision problem, optimal policy, value iteration algorithm, Belman equation.

10. Decision theory II. Decision in games, dominant strategy , Nash equilibrium, repeated games, grim trigger a tit for tat analysis. Cooperation in games.
11. Theory of learning I : supervised and unsupervised learning, Learning decision trees, PAC learning, linear models, regression and classification.
12. Theory of learning II : Bayesian learning , naive models, maximum likehood learning and continuous models, Bayesian learning with hidden parameters.

Recommended literature:

Artificial intelligence : A modern approach / Stuart J. Russell, Peter Norvig. Englewood Cliffs : Prentice-Hall, 1995
Artificial intelligence a new synthesis / Nils J. Nilsson. San Francisco : Morgan Kaufmann, 1998

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 99

A	B	C	D	E	FX
29,29	18,18	16,16	18,18	17,17	1,01

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 16.11.2021

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-953/15	**Course title:** Bioinformatics and Machine Learning
Number of credits: 4	
Educational level: II.	
Prerequisites: (FMFI.KI+KAI/2-INF-185/15 - Data Sources Integration or FMFI.KAI/1-DAV-202/20 - Data Management) and FMFI.KAI+KI/1-BIN-301/15 - Methods in Bioinformatics and FMFI.KAI/2-AIN-132/15 - Neural Networks and FMFI.KI/2-INF-221/15 - Approximation of Optimisation Problems and FMFI.KI/2-INF-237/00 - Selected Topics in Data Structures and (FMFI.KAMŠ/2-INF-175/15 - Probability and Statistics or FMFI.KAMŠ/2-INF-175/18 - Probability and Statistics) and FMFI.KAI/2-INF-150/15 - Machine Learning and (FMFI.KAI/2-INF-269/15 - Genomics or FMFI.KAG/2-INF-182/15 - Algebra (3))	
Course requirements: Oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: Students will consolidate their knowledge and skills acquired during Master studies. They will understand relationships between different areas and their broader context.	
Class syllabus: Oral exam from the selected area of computer science. The focus of the exam is defined by the prerequisites of the exam. The syllabus of the exam, announced in advance, is guided by the syllabi of individual prerequisite courses, but it is not strictly constrained by them.	
State exam syllabus:	
Languages necessary to complete the course: Slovak, English	
Last change: 09.11.2015	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-420/18	Combinatorial Analysis (1)

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KI/1-INF-420/15

Course requirements:
Written exam
Approximate grading scale: A#92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The students are aware of basic methods for computing finite sums, solving recurrent relations, deriving and solving combinatorial relations, finite calculus; they understand the basic theory of ordinary generating functions and can practically apply it; they can derive simple asymptotic estimates.

Class syllabus:
Linear recurrent relations and methods used to solve them. Finite sums, double and triple sums, transformation of summation range. Iverson bracket. Finite calculus. Integer functions. Sums involving integer and fractional parts. Combinatorics: generalised binomial theorem, binomial coefficients and sums over them, combinatorial identitites. Basics of generating functions. Application of generating functions to solving recurrent relations. Introduction to asymptotic analysis. Asymptotic hierarchy of functions. Stirling formula applications.

Recommended literature:
Concrete Mathematics : A Foundation for Computer Science / Ronald L. Graham, Donald E. Knuth, Oren Patashnik. Upper Saddle River : Addison-Wesley, 1994

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
37,5	12,5	12,5	18,75	12,5	6,25

Lecturers: doc. RNDr. Daniel Olejár, PhD., doc. RNDr. Martin Stanek, PhD., doc. RNDr. Ján Mazák, PhD.

Last change: 28.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-113/00	Combinatorial Analysis (2)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-420 Combinatorial Analysis (1)

Course requirements:
final exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will master the construction of asymptotic bounds and the calculus of ordinary and exponential generating functions.They are able to solve recurrence formulas, to evaluate sums using generating functions and to enumerate discrete objects using bivariate generating functions.

Class syllabus:
Importance of bounds. O-notation. Manipulating expressions with O. Basic methods of construction of asymptotic bounds: separation of main parts, boot-strapping, counting sums. Euler-McLaurin summation formula. Examples. Generating functions (GF) – ordinary and exponential. Generating functions calculus. Convolutions. Enumeration of discrete structures using generating functions. Solving recurrences by means of GF. Analytical theory of GF.

Recommended literature:
Concrete Mathematics : A Foundation for Computer Science / Ronald L. Graham, Donald E. Knuth, Oren Patashnik. Upper Saddle River : Addison-Wesley, 1994
Wilf H., S.: Generatingfunctionology, Academic Press, 1994
Sedgewick R., Flajolet Ph.: An introduction to the Analysis of Algorithms, Addison Wesley, 1996

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 91

A	B	C	D	E	FX
45,05	16,48	18,68	5,49	10,99	3,3

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-155/00	Combinatorial Structures

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Test and final exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will be able to understand and use the basic combinatorial structures with applications in discrete mathematics and informatics.

Class syllabus:
Permutations and Latin squares, orthogonality of Latin squares. Balanced block designs: symmetric designs and duality, difference sets, Hadamard matrices, finite projective planes, Steiner triple systems, relationship to graph decompositions. Graph embeddings into surfaces. Fundamentals of matroid theory, matroid and greedy algorithms.

Recommended literature:
F. Roberts: Applied combinatorics
M. Hall: Combinatorial theory
L. Kučera, J. Nešetřil: Algebraické metody diskrétní matematiky
J. Bosák: Rozklady grafov

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 89

A	B	C	D	E	FX
71,91	15,73	6,74	5,62	0,0	0,0

Lecturers: prof. RNDr. Martin Škoviera, PhD.

Last change: 13.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-144/15	Compilers

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Homework assignments, project, oral exam with written preparation.
Assessment (approx.): A 92%, B 84%, C 76%, D 68%, E 60%.
More detailed information is available on the website.
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will be able to design and formally specify a simple programming language and to implement its compiler using the syntax directed translation.

Class syllabus:
Compiler structure, lexical analysis, syntax analysis methods (top-down, bottom-up); syntax-directed translation. Type checking; Run time support. Metalanguage, code generation, computer models, register allocation; program optimization, data flow analysis, loop optimization, local optimizations. Optimizations for particular computer architectures.

Recommended literature:
Compilers: Principles, techniques, & tools / Alfred V. Aho ... [et al.]. Boston: Pearson/Addison-Wesley, 2007

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 54

A	B	C	D	E	FX
22,22	14,81	25,93	9,26	14,81	12,96

Lecturers: RNDr. Richard Ostertág, PhD., Mgr. Lukáš Kiss

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-277/18	Complex Analysis for Computer Scientists

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
homework assignments, written and oral exam
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will build up a general picture of the field of complex analysis and master some more specialised topics qualifying them for the course of analytic and enumerative combinatorics.

Class syllabus:
Complex arithmetic, topology of the complex plane, functions of a complex variable. Derivative of a complex variable function, Cauchy-Riemann conditions, holomorphic functions. Power series and analytic functions. Properties of some elementary functions. Integration in the complex plane. Cauchy's integral theorem for triangles and convex regions, homotopies, Cauchy's integral theorem for simply connected regions. Cauchy's integral formula, Liouville's theorem, the fundamental theorem of algebra, Cauchy's integral formula for derivatives. Talyor series and the equivalence of holomorphicity with analyticity. The uniqueness theorem. Laurent series, isolated singularities of single-valued functions. Winding number of a curve about a point. Morera's theorem. General variants of Cauchy's integral formula and Cauchy's integral theorem. Cauchy's residue theorem. Cauchy's argument principle. The maximum modulus principle. Multi-valued analytic functions, analytic continuation, monodromy theorem. Singularities and their classification, Puiseux series. Algebraic functions and their singularities. The gamma function and its properties, Stirling's approximation.

Recommended literature:
Electronic materials on the course website.
Introduction to Complex Analysis / H. A. Priestley. Oxford : Oxford University Press, 2003
Real and Complex Analysis, 3rd ed. / Walter Rudin. New York : McGraw-Hill, 1987
Complex Analysis / Andrei Bourchtein, Ludmila Bourchtein. Singapore : Springer, 2021
Theory of Functions of a Complex Variable, Vol. 3 / A. I. Markushevich. Englewood Cliffs : Prentice-Hall, 1967
Complex Analysis / Lars Ahlfors. New York : McGraw-Hill, 1979

Complex Variables and Applications, 8th ed. / James Ward Brown, Ruel V. Churchill. Boston : McGraw-Hill, 2009
Classical Complex Analysis / Liang-Shin Hahn, Bernard Epstein. Sudbury : Jones and Bartlett Publishers, 1996
Základy analýzy v komplexním oboru / Milan Šulista. Prague : SNTL, 1981
Analýza v komplexním oboru / Milan Šulista. Prague : SNTL, 1982

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 5

A	B	C	D	E	FX
80,0	0,0	0,0	0,0	0,0	20,0

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-121/15	Computability Theory

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-215 Formal languages and automata (1) AND 1-INF-210 Introduction to mathematical logic

Course requirements:
individual work
final exam: written and oral
Scale: A 90%, B 80%, C 70%, D 65%, E 60%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students will obtain a deep understanding of the Church-Turing thesis. They will know computational models whose equivalence forms the basis of this thesis. They will understand formalism of the primitive and general recursion. They will be familiar with hard algorithmically solvable problems (creative sets, many-to-one reductions etc.). They will understand how computability theory results imply impossibility of mechanical proofs in mathematics.

Class syllabus:
History of computability until 1950. Basic models of algorithmic computability, their comparison, simplification and equivalence. Primitive, recursive and partial recursive functions. Recursive sets and predicates. Hard problems, reductions and completeness. Arithmetization of syntax. Algorithmic view of Gödel's incompleteness theorems and related results. Recursion theorems.

Recommended literature:
Ani matematika si nemôže byť istá sama sebou : Úvahy o množinách, nekonečne, paradoxoch a Gödelových vetách / Pavol Zlatoš. Bratislava : Iris, 1995;
Course notes by the lecturer available at the course webpage;
Bachelor thesis Zeman, Marek: Súvis rekurzívnych funkcií a programovacích jazykov.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 36

A	B	C	D	E	FX
58,33	11,11	13,89	8,33	8,33	0,0

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/2-MPG-203/00	Computational Geometry

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Homeworks (written solutions of problems and their consulting 40%), final exam (oral exam with written preparation 60%). Rough evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
To acquaint the students with basic problems of computational geometry and their effective solutions.

Class syllabus:
Basic data structures of computational geometry.
Geometric searching.
Constructions of convex hull of finite set of points and modifications.
Proximity problems. Triangulations.
Intersection of polygons and polyhedra.

Recommended literature:
Zložitosť geometrických algoritmov / Pavel Chalmovianský, Andrej Ferko, Roman Galbavý. Bratislava : Univerzita Komenského, 2001
Boissonnat, Jean-Daniel; Yvinec, Mariette Algorithmic geometry. Translated from the 1995 French original by Hervé Brönnimann. (English) Zbl 0917.68212 Cambridge: Cambridge University Press. xxii, 519 p.(1998).
Okabe, Atsuyuki Author Profile; Boots, Barry; Sugihara, Kokichi; Chiu, Sung Nok Spatial tessellations. Concepts and applications of Voronoi diagrams. With a foreword by D. G. Kendall. 2nd ed. (English) Zbl 0946.68144 Wiley Series in Probability and Mathematical Statistics. Applied Probability and Statistics. Chichester: Wiley. xii, 671 p. (2000).

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution Total number of evaluated students: 155					
A	B	C	D	E	FX
29,68	10,97	15,48	13,55	13,55	16,77
Lecturers: doc. RNDr. Pavel Chalmovianský, PhD.					
Last change: 22.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-108/15	Computational Logic

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Semester:
- labs activity 10p (min 5p)
- homework 10p (min 5p)
- midterm 10p
- project 30p (min 15p)

Exam:
- oral exam 40p (min 20p)

Scale of assessment (preliminary/final): 60/40

Learning outcomes:
The course is concerned with problem solving by methods of computational logic, relying on modelling and automated inference. Students become acquainted with problem modelling in classical logic (SAT), and in logic programming (Prolog, ASP). The course focusses on the representational power of different formalisms and on algorithmic aspects (reasoning algorithms, their soundness and completeness). Students will get an overview of different implementations of reasoning algorithms, and practical experience with their usage.

Class syllabus:
- Classical propositional logic (recap)
- Encoding problems into SAT, using SAT sovlers
- Logic programming (syntax, SLDNF resolution, stable models)
- Encoding problems into logic programs, using LP solvers (Prolog, ASP)

Recommended literature:
Biere, A., Heule, M. and van Maaren, H. eds., 2009. Handbook of satisfiability (Vol. 185). IOS press.
Björk, M., 2011. Successful SAT encoding techniques. Journal on Satisfiability, Boolean Modeling
and Computation, 7(4), pp.189-201.

Sterling, L. and Shapiro, E.Y., 1994. The art of Prolog: advanced programming techniques. MIT press.
Baral, C., 2003. Knowledge representation, reasoning and declarative problem solving. Cambridge
university press.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 73

A	B	C	D	E	FX
8,22	12,33	17,81	17,81	16,44	27,4

Lecturers: doc. RNDr. Martin Homola, PhD., Mgr. Júlia Pukancová, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-172/12	Computer Algebra Systems

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
71,43	0,0	0,0	14,29	14,29	0,0

Lecturers: RNDr. Richard Ostertág, PhD., doc. RNDr. Martin Stanek, PhD.

Last change: 02.06.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-263/15	Computer Game Development and Design

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KI/2-INF-263/13

Course requirements:
Continuous evaluation: continuous solving of given problems, presentation of solutions, project
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course students are able to create their own game prototype in the Unity3D environment. They are able to analyse existing computer games, and to create own game mechanics. They also know how to develop own game engine.

Class syllabus:
History and classification of computer games. Story creation and gameplay, computer game design. Game design document and relation to the software specification. Introduction to 3D game design, scene graph, gaming objects. Design and implementation of a general game engine and its use for different types of games. Introduction to game creation in Unity3D. Advanced creation in Unity3D - scripting. Control and user interface. Typical actions and interactions in the virtual environment of the game. Realistic game modeling environment. Physical models. Network communication, multiplayer games. Standard communication models for games. Basic algorithms of artificial intelligence in games.

Recommended literature:
3D game engine design : A practical approach to Real-Time computer graphics / David H.; Eberly. Amsterdam : Elsevier, 2007 Game Coding Complete: Fourth Edition / Mike McShaffry, ;David Graham. Cengage Learning PTR, 2012 Game Development Essentials: An Introduction
(Third Edition) / Jeannie Novak. Cengage Learning, 2011

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 20					
A	B	C	D	E	FX
10,0	30,0	10,0	5,0	35,0	10,0
Lecturers: Mgr. Michal Ferko, PhD.					
Last change: 14.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/2-MPG-101/00	Computer Graphics (1)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
For the semester, the student can get 50% for exercises and 50% for the final exam. To successfully pass the final exam, the student must obtain at least half of the points for the exercises. The final exam is written (50% of rating) and oral (50% of rating), continuous assessment is in the form of projects and homework.
Evaluation: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), Fx (50-0).

Learning outcomes:
Students will gain knowledge about algorithmic solutions to basic computer graphics problems. They will learn the principles of working on the creation of simple graphics applications using computer graphics algorithms. They will be able to evaluate them in terms of efficiency, time and memory requirements.

Class syllabus:
1. Affine transformations in 2D and 3D space.
2. Representation and modeling of 3D objects.
3. Determining the visible surface of objects in a 3D scene.
4. Projection from 3D to 2D space.
5. Calculation of intersection of basic objects.
6. Clipping basic primitives with respect to window, convex and non-convex shapes.
7. Rasterization of lines and selected quadratic curves, filling of raster shapes.
8. Antialiasing methods in 2D discrete space, supersampling and image filtering.
9. Phases of the imaging process (3D graphics channel).

Recommended literature:
Eugen Ružický, Andrej Ferko: Počítačová grafika a spracovanie obrazu, Bratislava: Sapientia, 1995
Jiří Žára a kol.: Moderní počítačová grafika, Computer Press, 2004
Allan Watt: 3D computer graphics (3rd edition), Addison Wesley, 1999
Philip Schneider, David Eberly: Geometric Tools for Computer Graphics, Morgan Kaufmann, 2003

Donald Hearn, Pauline Baker, Warren Carithers: Computer Graphics with Open GL (4th Edition), Pearson, 2010
Steve Marschner, Peter Shirley: Fundamentals of Computer Graphics (5th Edition), A K Peters/ CRC Press 2021

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 596

A	B	C	D	E	FX
14,93	13,26	16,28	20,64	21,81	13,09

Lecturers: RNDr. Martina Bátorová, PhD., RNDr. Róbert Bohdal, PhD.

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/2-MPG-102/00	Computer Graphics (2)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2., 4.

Educational level: II.

Prerequisites: FMFI.KAG/2-MPG-101/00 - Computer Graphics (1)

Course requirements:
For the semester, the student can get 40% for exercises and 60% for the final exam. To successfully pass the final exam, the student must obtain at least half of the points for the exercises. The final exam is only oral, continuous assessment is in the form of projects and homework.
Evaluation: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), Fx (50-0).

Learning outcomes:
Students will gain the necessary theoretical foundations and the ability to work with basic and advanced techniques of photorealistic computer graphics in 3D.

Class syllabus:
1. Spherical coordinates and direction (vector) in 3D, basic concepts of radiometry and photometry.
2. Interaction of light with the surface, BRDF definition, reflection equation, reflectance.
3. BRDF models, empirical models, physically based models, models based on measured data.
4. Shading methods, Gouraud, Phong and Blinn-Phong illumination model.
5. Ray casting, ray tracing, forward vs backward tracing, CSG and ray tracing.
6. Intersection of ray with parametric and algebraic surfaces.
7. Acceleration methods for ray tracing - bounding objects/volumes.
8. Acceleration methods for ray tracing - dividing the scene space.
9. Distributed ray tracing.
10. Monte Carlo integration and the reflection equation, integral estimation (estimator).
11. Monte Carlo integration and sampling, samples generation methods.
12. Multiple importance sampling and combined estimator.
13. Rendering equation, global vs local illumination.
14. Path tracing and bidirectional path tracing.
15. From rendering equation to radiosity, form-factor calculation.
16. Textures, texture mapping, texture filtering, procedural textures.
17. Shadows, shadows calculation methods.

Recommended literature:

Eugen Ružický, Andrej Ferko: Počítačová grafika a spracovanie obrazu, Bratislava: Sapientia, 1995
Jiří Žára a kol.: Moderní počítačová grafika (2. vydání), Computer Press, 2004
Samuel Buss: 3-D Computer Graphics - A Mathematical Introduction with OpenGL. Cambridge University Press, 2003
John Hughes, Andries van Dam, et al: Computer Graphics: Principles and Practice. Addison-Wesley, 2013
Tomas Akenine-Möller, Eric Haines, et al: Real-Time Rendering (4th Edition), A K Peters, 2018
Matt Pharr, Wenzel Jakob, Greg Humphreys: Physically Based Rendering: From Theory to Implementation (3rd Edition). Morgan Kaufmann, 2016
Steve Marschner, Peter Shirley: Fundamentals of Computer Graphics (5th Edition), A K Peters/ CRC Press 2021

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 283

A	B	C	D	E	FX
16,25	19,43	23,32	17,31	16,25	7,42

Lecturers: RNDr. Róbert Bohdal, PhD., Mgr. Marcel Makovník

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-183/15	Computer Networks (2)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-283

Course requirements:
practical assignments during semester, written final test (at least 50% required) and oral final exam (may be waived)
Approximate grading scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will be familiar with principles and practical application of advanced technologies in computer networks and data communication.

Class syllabus:
802.1q, STP, DOCSIS , IP routing protocols (BGP, OSPF), advanced topics in TCP (syn-cookies, ECN, ...).
Theoretical principles of data transmission, maximal bandwidth, CRC, modulation techniques, multiplexing, FDMA, TDMA, CDMA, synchronous and asynchronous links, PPP.

Recommended literature:
Computer Networks / Andrew S. Tanenbaum, David J. Wetherall. Boston : Pearson education, 2011
Computer Networks / Andrew S. Tanenbaum. Upper Saddle River : Prentice-Hall, 2003
Data and computer communications / William Stallings. Upper Saddle River : Prentice-Hall, 2004

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 92					
A	B	C	D	E	FX
25,0	40,22	22,83	7,61	3,26	1,09
Lecturers: RNDr. Jaroslav Janáček, PhD.					
Last change: 22.06.2022					
Approved by:					

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-952/15	**Course title:** Computer Security
Number of credits: 4	
Educational level: II.	
Prerequisites: FMFI.KI/2-INF-262/15 - IT Infrastructure Security and FMFI.KI/2-INF-178/15 - Cryptology (1) and FMFI.KI/2-INF-223/15 - IT Security Management and FMFI.KI/2-INF-183/15 - Computer Networks (2) and FMFI.KI/2-INF-176/15 - Unix for System Administrators and FMFI.KI/2-INF-224/15 - Theory of Information and Theory of Coding (1) and FMFI.KI/2-INF-225/15 - Theory of Information and Theory of Coding (2)	
Course requirements: Oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: Students will consolidate their knowledge and skills acquired during Master studies. They will understand relationships between different areas and their broader context.	
Class syllabus: Oral exam from the selected area of computer science. The focus of the exam is defined by the prerequisites of the exam. The syllabus of the exam, announced in advance, is guided by the syllabi of individual prerequisite courses, but it is not strictly constrained by them.	
State exam syllabus:	
Languages necessary to complete the course: Slovak, English	
Last change: 09.11.2015	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/1-EFM-340/13	Computer Statistics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: I., II.

Prerequisites: FMFI.KAMŠ/1-MAT-282/00 - Probability and Statistics (2) or FMFI.KAMŠ/2-INF-175/18 - Probability and Statistics

Recommended prerequisites:
Probability and statistics (2) 1-MAT-282 or Probability and statistics 2-INF-175

Course requirements:
project (teaching period), written exam using computer
Approximate grade thresholds: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Using the software "R" students will be able to perform basic statistical analysis of real data.

Class syllabus:
History of R and comparison with other systems. Arithmetic, logical operators. Data import and visualization, descriptive statistics. Tests of normality. Tests about location parameters, proportions, and correlation coefficients. Linear regression: estimates, tests, confidence regions, submodels, diagnostic. ANOVA. Modern methods of statistics (cluster and discriminant analysis, Monte Carlo).

Recommended literature:
Dalgaard P: Introductory Statistics with R. Springer 2008.
Anděl J: Statistické metody. Matfyzpress 2007.
Venables W N et al.: An Introduction to R. The R Foundation 2021.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 378

A	B	C	D	E	FX
58,47	12,17	10,05	9,26	6,08	3,97

Lecturers: Mgr. Ján Somorčík, PhD.
Last change: 11.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-179/15	Concurrent and Distributed Programming and Systems (1)

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Homework assignments, exam.
The evaluation is governed by the education quality system of Comenius University.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
The student will acquire knowledge of principles of parallel programming with shared memory, know its purpose and typical applications. The student will have direct practical experience with selected information technologies for creating parallel programs with shared memory.

Class syllabus:
Concept of processes and threads, Purpose of programming with processes and threads. Life cycle and scheduling of processes and threads in operating systems. Examples of using threads. Creating and terminating threads.
Thread synchronisation. Shared variables, critical sections. The problem of mutual exclusion and the possibilities of its solution. Semaphores, mutexes, conditional variables. Mutual simulations of synchronization means. Implementation of synchronization mechanisms in computer systems. Memory models. Threads in Unix systems. Thready in Java. Monitor. Thread-safety. Deadlock, livelock, polling. Correctness of multithreaded programs. Measuring the effeciency of multithreaded
programs. Parallel scientific computations with shared memory. Related information technologies.

Recommended literature:
M. Ben-Ari: Principles of Concurrent Programming. Prentice-Hall, 1982
D. Lea: Concurrent Programming in Java: Design Principles and Patterns, 1999
D. Buttlar, J. Farrell, B. Nichols: PThreads Programming: A POSIX Standard for Better Multiprocessing, O'Reilly Media, 1996

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 31					
A	B	C	D	E	FX
32,26	0,0	12,9	9,68	16,13	29,03
Lecturers: doc. Mgr. Tomáš Plachetka, Dr.					
Last change: 23.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-180/15	Concurrent and Distributed Programming and Systems (2)

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-INF-179

Course requirements:
Projects and exam
The evaluation is governed by the education quality system of Comenius University.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with principles of parallel programming with processes, its goals and typical applications. They will have a concrete practical experience with selected information technologies for implementation of parallel programs involving process communication.

Class syllabus:
Purposes of multi-process programs. Abstract models of distributed systems. Comparison of models, simulation of models.
Paradigms for creation, termination and identification of processes. Channel model. Point-to-point model. Support of process communication in computer systems. Related information technologies.
Process failures. Consensus problems and approaches to solving them. Transaction systems, distributed databases.
Load balancing. Problem formulation, approaches to solving it. Measuring and comparing efficiency of solutions.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
33,33	66,67	0,0	0,0	0,0	0,0

Lecturers: doc. Mgr. Tomáš Plachetka, Dr., prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-145/15	Creating Internet Applications

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Project, written and oral exam with practical component.
Approximate grading scale: A 94%, B 88%, C 81%, D 75%, E 69%.
More detailed information is available on the website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be able to implement internet applications using selected modern technologies, software engineering practices and complex application framework.

Class syllabus:
Selected modern technologies: client-side scripting (JavaScript, jQuert), raster (canvas) and vector (SVG, D3) client-side graphics rendering, two-way communication between the server and the client (WebSockets). Complex application framework (e.g. React). Security of internet applications.

Recommended literature:
Douglas Crockford. JavaScript: The Good Parts: The Good Parts. O'Reilly Media, 2008, ISBN-13: ‍978-0596517748.
Vanessa Wang, Frank Salim, Peter Moskovits. The Definitive Guide to HTML5 WebSocket. Apress, 2013, ISBN-13: ‍978-1430247401.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 189

A	B	C	D	E	FX
18,52	15,34	22,22	16,93	13,76	13,23

Lecturers: RNDr. Richard Ostertág, PhD., Mgr. Askar Gafurov, PhD.

Last change: 22.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-178/15	Cryptology (1)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Homework assignments,
Condition for qualifying for the exam: timely and correctly solved all homework assignments,
Exam: written exam,
Approximate grading scale: A#92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The students will have the knowledge of basic cryptographic constructions; they will understand security guarantees provided by these constructions, and assumptions required for their security. The students will be able to choose a suitable cryptographic construction for given application / information system.

Class syllabus:
symmetric ciphers (block and stream ciphers), asymmetric ciphers, underlying problems for asymmetric constructions, hash functions, message authentication codes, digital signatures, passwords, secret sharing schemes, cryptographic protocols and related attacks, zero-knowledge proofs

Recommended literature:
Douglas R. Stinson, Maura Paterson: Cryptography: Theory and Practice, Chapman and Hall/ CRC; 4th edition, 2018
Nigel P. Smart: Cryptography Made Simple, Springer, 2016
Jean-Philippe Aumasson: Serious Cryptography: A Practical Introduction to Modern Encryption, 2017
Other on-line resources

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 81					
A	B	C	D	E	FX
12,35	9,88	17,28	19,75	27,16	13,58
Lecturers: doc. RNDr. Martin Stanek, PhD.					
Last change: 28.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-235/15	Cryptology (2)

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-INF-178 Cryptology (1)

Course requirements:
Project (presentation of chosen topic),
Condition for qualifying for the exam: satisfactory presentation,
Exam: written exam,
Approximate grading scale: A#92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Student will be familiar with advanced cryptographic constructions. They will be able to identify and use weak spots in a design or implementation of a cryptosystem for its cryptanalysis. They will be able to use formal methods for security verification.

Class syllabus:
formal security definitions and proofs for cryptographic constructions, cryptanalysis of symmetric ciphers, lattices in cryptology, multiparty secure computation, advanced cryptographic constructions and protocols

Recommended literature:
Jonathan Katz, Yehuda Lindell: Introduction to modern cryptography, Chapman & Hall/CRC Press, 2008
Douglas R. Stinson, Maura Paterson: Cryptography: Theory and Practice, Chapman and Hall/CRC; 4th edition, 2018
Nigel P. Smart: Cryptography Made Simple, Springer, 2016
Other on-line resources

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 24					
A	B	C	D	E	FX
29,17	16,67	20,83	12,5	12,5	8,33
Lecturers: doc. RNDr. Martin Stanek, PhD.					
Last change: 28.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-188/17	Current Approaches in Machine Learning

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
ongoing evaluation: homework, project
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completion of the course, students will be able to train modern architectures of neural networks, and efficiently use the scientific literature from this field.

Class syllabus:
Problems in neural network training (vanishing gradient, ...) and their solutions (Xavier's initialization,...); New architectures of neural networks (LSTM, GRU, GAN, Relu activation,...); Reinforced learning in neural networks; Current practical applications from literature

Recommended literature:
Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep learning. MIT press, 2016.; Papers from conferences NIPS, ICLR, ICML.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 27

A	B	C	D	E	FX
62,96	14,81	0,0	0,0	11,11	11,11

Lecturers: Mgr. Vladimír Boža, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-DAV-202/20	Data Management

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 1 / 2 **per level/semester:** 13 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KI+KAI/2-INF-185/15

Course requirements:
During semester: homework (45%), project proposal (5%).
Durig exam period: project and oral exam (50%). Grades A: 90..100, B: 80...89, C: 70...79, D: 60...69, E: 50...59, FX: 0..49. More information on the course website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be able to process large data sets with general and specialized tools. They will also be able to present the methods used and visualize the results.

Class syllabus:
Reproducibility of computational analyses. Processing text files with UNIX tools. Basics of the Perl language. Databases and SQL. System R. Use of Python to automate data downloads and to process text data. Shared cluster computing and cloud infrastructure. Highly parallel computing tools.

Recommended literature:
Building bioinformatics solutions : with Perl, R, and MySQL / Conrad Bessant, Ian Shadforth, Darren Oakley. Oxford : Oxford University Press, 2009
The Data Science Design Manual / Steven S. Skiena. Springer 2017

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 109

A	B	C	D	E	FX
49,54	22,02	11,93	6,42	5,5	4,59

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD., Mgr. Vladimír Boža, PhD.
Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI+KAI/2-INF-185/15	Data Sources Integration

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 1 / 2 **per level/semester:** 13 / 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/1-DAV-202/20

Course requirements:
Homework assignments, project. computer-based final exam
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with data sources in bioinformatics and basic bioinformatics tools. They will be able to process large data sets by general-purpose as well as specialized tools. They will be able to present used methos and vizualize results.

Class syllabus:
Reproducibility of computational analyses, processing of text file with UNIX tools. basics of Perl programming language, databases and SQL, statistical system R. specialized bioinformatics tools and databases

Recommended literature:
Building bioinformatics solutions : with Perl, R, and MySQL / Conrad Bessant, Ian Shadforth, Darren Oakley. Oxford : Oxford University Press, 2009

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 109

A	B	C	D	E	FX
49,54	22,02	11,93	6,42	5,5	4,59

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD., Mgr. Vladimír Boža, PhD.

Last change: 11.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-500/11	Databases

Educational activities:
Type of activities: lecture / laboratory practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-230 Introduction to Database Systems

Course requirements:
homeworks
exam
The evaluation is governed by the education quality system of Comenius University.

Learning outcomes:
The student will acquire knowledge of query semantics, query optimization, higher normal forms of relational databases, distributed databases, selected modern trends.

Class syllabus:
Query semantics in Prolog and Datalog, computation of queries with functional symbols, query optimization techniques, higher formal forms, distributed databases, selected modern trends.

Recommended literature:
S. Abiteboul, R. Hull, V. Vianu: Foundations of Databases, Pearson Education, 1994
P.A. Bernstein, V. Hadzilacos, N. Goodman: Concurrency Control and Recovery in Database Systems, Addison-Wesley, 1987
H. Garcia-Molina, J.D. Ullman, J. Widom: Database Systems, The Complete Book, Prentice Hall, 2003
C. Zaniolo: Advanced Database Systems, Morgan Kaufmann, 1997
P.A. Bernstein, E. Newcomer: Transaction Processing (2nd ed.), Morgan Kaufmann, 2009

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 185					
A	B	C	D	E	FX
18,92	11,89	19,46	15,68	18,92	15,14
Lecturers: doc. Mgr. Tomáš Plachetka, Dr., doc. RNDr. Ján Mazák, PhD.					
Last change: 28.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-266/17	Declarative Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary assessment: homeworks, tests.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To give mathematical foundations of declarative programming languages.

Class syllabus:
1. Primitive Recursive Functions. Basic functions and operations. Explicit definitions. Bounded minimalization. Pairing function and arithmetization. Recursion with substitution in parameters. Nested simple recursion. Recursion with measure. Regular recursive definitions.
2. General Recursive Functions. Beyond primitive recursion: Ackermann-Péter function, universal function for primitive recursive functions. Primitive recursive indices. Transfinite recursion. General recursive functions. Regular minimalization. μ-Recursive functions.
3. Partial Recursive Functions. First recursion theorem (fixed point theorem). Computation model. Equivalence of the operational and denotational semantics. Partial recursive functions. Unbounded minimalization. Arithmetization of computation. Kleene normal-form theorem. Universal function. Recursive indices. Enumeration theorem. Partial μ-recursive functions. Church thesis. Recursively decidable, semidecidable and undecidable problems.

Recommended literature:
[1] Recursive Functions / Ján Komara. Online.
[2] Úvod do teórie algoritmov / Ivan Korec. Bratislava : Univerzita Komenského, 1983.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
0,0	0,0	50,0	50,0	0,0	0,0

Lecturers: Ing. Ján Komara, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-270/15	Design and Evaluation of User Interfaces

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 14

A	B	C	D	E	FX
57,14	28,57	0,0	14,29	0,0	0,0

Lecturers: Sapan Bhatia, PhD.

Last change: 02.05.2016

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-920/00	Diploma Thesis Seminar (1)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Presentation at a seminar, written report
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be able to prepare both written and oral presentation on the current state of the art in a given topic and on planned goals of their master thesis. They will refer on their progress during the semester. They will be familiar with required thesis form and style.

Class syllabus:
Form and contents of a diploma thesis. Technical writing guidelines.
Student presentations based on literature related to their thesis topic. Discussions about presentations.

Recommended literature:
Individual, based on the thesis topic and thesis advisor recommendation.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 316

A	B	C	D	E	FX
70,25	6,96	11,39	3,16	1,9	6,33

Lecturers: prof. RNDr. Branislav Rovan, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-923/20	Diploma Thesis Seminar (1) B

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites: FMFI.KI/2-INF-920/00 - Diploma Thesis Seminar (1)

Course requirements:
Presentations at the seminar
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be able to refer on their progress. They will be able to prepare and regularly update a longer technical document.

Class syllabus:
Form and contents of a diploma thesis. Technical writing guidelines.
Student presentations on their progress on the thesis topic. Discussions about presentations.

Recommended literature:
Individual, based on the thesis topic and thesis advisor recommendation.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 19

A	B	C	D	E	FX
94,74	0,0	0,0	0,0	5,26	0,0

Lecturers: prof. RNDr. Martin Škoviera, PhD.

Last change: 25.05.2020

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-921/00	Diploma Thesis Seminar (2)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites: FMFI.KI/2-INF-920/00 - Diploma Thesis Seminar (1)

Course requirements:
Presentations at the seminar.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be able to refer on their progress. They will be able to prepare and regularly update a longer technical document.

Class syllabus:
Form and contents of a diploma thesis. Technical writing guidelines.
Student presentations on their progress on the thesis topic. Discussions about presentations.

Recommended literature:
Individual, based on the thesis topic and thesis advisor recommendation.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 281

A	B	C	D	E	FX
93,24	0,0	0,71	0,0	0,0	6,05

Lecturers: doc. RNDr. Martin Stanek, PhD., prof. RNDr. Martin Škoviera, PhD.

Last change: 21.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-922/00	Diploma Thesis Seminar (3)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites: FMFI.KI/2-INF-921/00 - Diploma Thesis Seminar (2)

Course requirements:
presentation at the seminar, thesis submission
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be able to present their results and to prepare presentations of different durations, for different audiences etc.

Class syllabus:
Different versions of a presentation of the diploma thesis results. Discussion about presentations. Checking the written form of thesis drafts. Final presentation.

Recommended literature:
Individual, based on the thesis topic and thesis advisor recommendation.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 266

A	B	C	D	E	FX
93,98	0,38	3,01	0,0	0,0	2,63

Lecturers: doc. RNDr. Martin Stanek, PhD.

Last change: 06.09.2019

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-231/00	Efficient Parallel Algorithms

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
evaluation during semester: homeworks
exam: written and optional oral
Scale of assessment (preliminary/final): 10/90

Learning outcomes:
Students will be familiar with basic design techniques for parallelizing algorithms in the PRAM model.

Class syllabus:
Course gives an introduction to designing effective parallel algorithms, starting with PRAM like models, continuing with design techniques up to a survey of effective parallel algorithms in selected areas. The lecture covers: Parallel models (PRAM, parallel nets), basic design techniques of effective parallel algorithms, parallel searching and sorting, parallel graph algorithms, parallel pattern matching and parallel algorithms in planar geometry.

Recommended literature:
An introduction to parallel algorithms / Joseph Jájá. Boston : Addison-Wesley, 1992

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 201

A	B	C	D	E	FX
41,79	12,94	19,4	6,97	14,93	3,98

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-233/13	English Conversation Course (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational English as well as English for specific purposes appropriate for university students. This course is a follow up of the previously taught ESP course.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge.

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 215

A	B	C	D	E	FX
67,44	13,02	6,51	1,86	1,4	9,77

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-234/13	English Conversation Course (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, oral presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational/spoken English as well as English for specific purpose appropriate for university students. This course is a follow up of the Conversational English course 1.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge(Upper-Intermediate/Lower Advanced).

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 146

A	B	C	D	E	FX
77,4	12,33	3,42	1,37	0,0	5,48

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-154/00	Enumeration of Discrete Structures

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Enumeration of labeled objects, number of different labelings of graphs, connected graphs, blocks, Eulerian graphs, k-colorable graphs, acyclic oriented graphs, trees, cliques, Eulerian moves in oriented graphs. Enumeration of unlabeled objects – Pólya´s theory. Algorithms: independent set, domination set, coverings, coloring, matchings. Connection between selected important propositions.

Recommended literature:
Aigner: Combinatorial theory
Reinhold, Nievergelt, Deo: Combinatorial algorithms
Plesník J.: Grafové algoritmy

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 10

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Eduard Toman, CSc.

Last change: 02.06.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-186/15	Formal Languages and Automata (2)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-215 and 1-INF-220

Course requirements:
Homework assignments and semester tests, final written and oral exam.
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students are familiar with properties of all classes in the Chomsky hierarchy. They understand the concept of decidability and complexity and know decidability status of basic problems for individual classes of the Chomsky hierarchy. They are familiar with basic methods of syntactic analysis and their connection to deterministic push-down automata.

Class syllabus:
Regular languages (characterization by equivalence relations). Finite state transducers. Context-sensistive grammars, linear bounded automata. Properties of language classes in the Chomsky hierarchy. Decidable and undecidable problems in the Chomsky hierarchy. Deterministic context-free grammars and basic methods of syntactic analysis.

Recommended literature:
Introduction to Automata Theory, Languages, and Computation / John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman. Boston : Pearson/Addison-Wesley, 2007
Gries, David. "Compiler construction for digital computers." Wiley (1971).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 83

A	B	C	D	E	FX
56,63	8,43	13,25	10,84	7,23	3,61

Lecturers: prof. RNDr. Branislav Rovan, PhD., RNDr. Šimon Sádovský, PhD., Mgr. Lukáš Kiss
Last change: 10.02.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-123/15	Formal Semantics and Theory of Correctness

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-INF-187 Introduction to Theory of Programming

Course requirements:
Written tests
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students will be familiar with principles, methods and techniques of modelling denotational semantics of imperative programming languages for selected types of control constructs and data structures. They will be able to analyse, design and prove properties of logical inference systems of Hoare type for proving partial correctness of computer programs. They will be familiar with untyped λ–calculus, which forms theoretical foundation of functional languages and with principles of defining denotational semantics of untyped languages.

Class syllabus:
Theory of correctness:
* definition of denotational semantics (semantic models) of imperative languages without cycles, with cycles, with block structures, with array reference, including semantics of specification language and language of correctness formulas
* definition and analysis of inductive formulas, weakest precondition, strongest postcondition in individual languages and semantic models, their expressibility in a given specification language
* design and analysis of Hoare system for proving partial correctness for given programming languages (soundness and completeness of a Hoare system)
Modeling of semantics of special language constructs:
* continuation semantics, definition of denotational semantics for programming languages with goto statements
* denotational semantics of of parameter-free recursive procedures
Lambda calculus
* basic definitions: λ–term, β–conversion, α–conversion
* equational theory of λ–calculus

* λ–reduction - operational semantics of λ–calculus
* λ–computability, λ–calculus as a computational model
* denotational semantics of untyped languages, reflexive domains

Recommended literature:
Course notes and articles provided on the course webpage

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
60,0	13,33	20,0	0,0	0,0	6,67

Lecturers: RNDr. Igor Prívara, CSc.

Last change: 13.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-127/00	Formal Specifications

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-INF-123 Formal Semantics and Theory of Correctness

Course requirements:
Project, written exam
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with the following topics:
- the role of the formal methods in the software design and development
- two basic formal specification approaches to the software design - property oriented approach (algebraic specifications), resp. model-oriented approach (Z-specifications)
- study the following aspects of both formal methods
- modular design on the specification level
- semantics (models) of specifications
- proving properties of specifications
- stepwise refinement of the specification implementation
- prototyping of formal specifications

Students will gain experience with formal specification design on examples of different sizes including a project in specification of software or information system

Class syllabus:
- formal specifications – role of formal specifications in software design, formalization methods requirements, brief summary and comparison of different approaches
- algebraic specifications - signature and axioms, algebraic specifications using the SL, modular design of algebraic specification (composition of specifications, parametric specifications), specifications of errors and exceptions
- semantics of algebraic specifications - models of algebraic specifications, different approaches to characterize algebraic specification semantics (initial, loose a behavioral semantics), semantic requirements for composition of specification (sufficent completeness, hierarchical consistency), hierarchical semantics of algebraic specifications

- constructive algebraic specifications - constructors, inductive design of properties (axioms), computational model of algebraic specifications (term rewriting systems), canonical specification
- implementation of specification - implementation resp. behavioral implementation
- equational logic – proving equation in one-sorted, many-sorted and order-sorted signature, proving in inductive theories, proving of behavioral properties
- Z-specifications – pre-defined types in the Z specification language (sets, types, logic functions a quantifiers, relations, functions), specification schemes (composition od schemes, generic schemes), specification of a state
- stepwise refinement of Z-specifications - program development from specifications, design principles of data structures and algorithms using Z
- comparative study - algebraic specifications vs. Z-specifications

Recommended literature:

Wirsing,P.: Algebraic Specifications. Handbook of Theoretical Computer Science, Vol. B, Formal Models and Semantics, Elsevier Science Publisher B.V., 1990
Van Horebeek,I., Lewi,J.: Algebraic Specifications in Software Engineering. Springer Verlag, 1989
Potter,B., Sinclair,J., Till,D.: An Introduction to Formal Specifications and Z. Prentice Hall, 1991
Wordsworth,J.B.: Software Development with Z (A Practical Approach to Formal Methods of Software Engineering). Addison Wesley, 1992
Alagar,V.S., Periyasamy,K.: Specification of Software Systems. Springer Verlag, 1998

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
25,0	37,5	12,5	12,5	12,5	0,0

Lecturers: RNDr. Igor Prívara, CSc.

Last change: 13.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-141/00	French Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
French language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of French.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 435

A	B	C	D	E	FX
45,75	20,0	18,85	8,74	2,3	4,37

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-142/00	French Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject continues the program of French language (1) and provides courses of essential and intermediate French language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 265

A	B	C	D	E	FX
38,87	25,28	19,62	10,19	2,64	3,4

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-241/00	French Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French language, covering not only general, but also technical language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 104

A	B	C	D	E	FX
39,42	27,88	21,15	6,73	0,96	3,85

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-242/00	French Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French covering not only general, but also technical French language.

Recommended literature:
Menand Robert: Le Nouveau taxi 2, Hachette FLE, Paris, France 2009, ISBN 978-2-01-155551 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 74

A	B	C	D	E	FX
41,89	32,43	17,57	2,7	1,35	4,05

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-116/14	Functional Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
homeworks, written exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
students will know what is functional programming, basics of lambda calculus and advanced technology functional programming

Class syllabus:
Functional pearls, R.Bird
The transformation of functional programs
Functional morphisms a scheme recursion
Introduction to the lambda calculus
Properties lambda theory
Interpreter lambda calculus
Type systems
Logic combinators
Monadic parsing and parsers
Monads

Recommended literature:
Functional programming : practice and theory / Bruce J. MacLennan. Reading : Addison-Wesley, 1989
Haskell the craft of functional programming / Simon Thompson. Harlow : Pearson, 1999
Abstract computing machines : A lambda calculus perspective / W. Kluge. Berlin : Springer, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 83					
A	B	C	D	E	FX
45,78	3,61	19,28	10,84	20,48	0,0
Lecturers: RNDr. Peter Borovanský, PhD.					
Last change: 14.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-254/15	Fuzzy Inference and Expert Systems

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-AIN-287 Znalostné systémy

Course requirements:
Tests:
Approximate evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Theoretical and practical fundamentals of fuzzy logic, inference and expert systems

Class syllabus:
- Uncertainty and its formalization (triangular (co) standard connection.
- Many valued (fuzzy) logic (Lukasiewicz, Goedel, product).
- Fuzzy Sets.
- Fuzzy numbers and arithmetic.
- Modifiers fuzzy sets (Hedges).
- Fuzzy Reasoning, compositional rule of inference (CRI)
- Fuzzy rules - Mamdani-ho type.
- Fuzzy rules - Takagi-Sugeno-ho type.
- Linguistic variable Zadeh approach.
- Fuzzification.
- Defuzzification.
- Fuzzy inference systems.
- Fuzzy expert systems.

Recommended literature:
Fuzzy množiny a jejich aplikace / Vilém Novák. Praha : Státní nakladatelství technické literatury, 1986
http://ii.fmph.uniba.sk/~guller/Synlogy.pdf

Languages necessary to complete the course:

slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
55,56	11,11	22,22	11,11	0,0	0,0

Lecturers: doc. RNDr. Dušan Guller, PhD.

Last change: 23.09.2017

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-INF-269/15	Genomics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-BIN-301 Methods in bioinformatics

Course requirements:
Active perticipation on a group project 50%, final written test 50%. Grades A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with basic concepts of genomics, transcriptomics, proteomics, interactomics, systems biology and synthetic biology, functional and comparitive analysis of complex systems and their importance for current biomedical research. They will kow experimental strategies for sequencing whole genomes, annotating genes and exploring their biological functions. They will also gain practical experience with processing whole genome data.

Class syllabus:
Genomics and its importance for current biomedical research. From individual genes to whole genomes. Physical genome mapping techniques. Experimental strategies of whole genome sequencing (from bacterial genomes to the human genome). genomics and personalized medicine. Personal genomes and ethical aspects of genomics. Personalized therapies. Molecular phylogenomics. Paleogenomics. Metagenomics. Sequencing DNA from complex biological communities. Analysis of dynamics of microbial communities. New technologies for DNA sequencing. From chemical and enzymatic methods to automated DNA analyzers. Sequencing nucleic acids by SBS, SBL and SBH methods. Nanopore sequencing.
Principles of whole genome annotation and analysis. Categorization of genes and functional elements in genomes. Bioinformatics principles of gene finding. Gene and genome databases.
Comparative and evolutionary genomics. Evolutionary processes at the genome level.
Functional analysis of complete genomes. Transcriptome and proteome analysis methods. Analysis of gene and protein networks, interactomes and metabolomes.
Introduction to systems biology and mathematical modelling. Biological systems as computer models. Fundamenal mathematical models in biology.

Synthetic biology. Minimal genome. Methods of synthetic biology. DNA synthesis techniques from oligonucleotide production to synthesis of whole genomes. Synthetic microorganisms. Biotechnology applications of synthetic organisms.

Recommended literature:
Nosek, J. et al. (2013) Genomika. CreateSpace Independent Publishing Platform.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
56,76	21,62	8,11	0,0	13,51	0,0

Lecturers: prof. RNDr. Jozef Nosek, DrSc., doc. Mgr. Tomáš Vinař, PhD., doc. Mgr. Bronislava Brejová, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/1-MAT-551/10	Geometry for Graphics (1)

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 512

A	B	C	D	E	FX
21,29	14,84	18,55	19,92	17,77	7,62

Lecturers: Mgr. Ľudovít Balko, PhD.

Last change: 02.06.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-151/00	German Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at three levels: beginner, intermediate and advanced. Students opt for one of them depending on whether they need to learn the fundamentals or maintain and/or improve their previous knowledge.
This course's focus is to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 734

A	B	C	D	E	FX
36,1	27,25	19,62	8,99	2,72	5,31

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-152/00	German Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of German.
This course's focus is to to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 480

A	B	C	D	E	FX
36,04	20,21	20,83	13,13	3,33	6,46

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-251/00	German Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1,2). The subject provides a course of intermediate or advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 165

A	B	C	D	E	FX
41,21	25,45	20,61	6,67	2,42	3,64

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-252/00	German Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1-3). It provides a course of intermediate and advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
42,22	24,44	12,22	12,22	3,33	5,56

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-174/15	Graph Theory

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-160 Introduction to combinatorics and graph theory

Course requirements:
Approximate scale of evaluation: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80maximum 20% of evaluation can be obtain by solving homoworks

Learning outcomes:
The course will provide students with solid foundations of graph theory by proving key classical theorems and explaining the most important graph algorithms. Emphasis is also placed on motivation from other scientific disciplines and technology and possible applications of the covered topics.

Class syllabus:
Basic terminology: trees, bipartite graphs, graph and labyrinth search. Eulerian graphs. matchings in graphs, König's theorem, Hall theorem and its corollaries. measuring of graph connectivity. Menger's theorem, Planar graphs, Euler's theorem. Kuratowski's theorem. Graph coloring: some NP-hard problems, greedy algorithm. Brooks' theorem. Vizing's theorem. Coloring of planar graphs. Flows, Ford–Fulkerson algorithm and its applications. Integer and group flows, relationship to coloring. Hamiltonian graphs. Chvátal's theorem. Random graphs, probabilistic models, properties of random graphs.

Recommended literature:

Languages necessary to complete the course:
Slovak, English.

Notes:

Past grade distribution
Total number of evaluated students: 76

A	B	C	D	E	FX
38,16	18,42	17,11	15,79	9,21	1,32

Lecturers: doc. RNDr. Edita Mačajová, PhD., prof. RNDr. Martin Škoviera, PhD.

Last change: 28.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-279/21	Hyperprogramming

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
ongoing evaluation: homework
exam: written/oral
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
The students master a new method of implementation of complex information systems, that allows to implement an example system (e.g. a database of books and authors) within minutes.

Class syllabus:
Extension of Object-Oriented Programming to the architecture dimension. New ways information systems implementation: Configuration-oriented programming; composite configuration - Hyperprogramming. Comparison of current and new ways of creation complex information systems. Application of theoretical concepts and models in practice.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 4

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Radovan Brečka, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-261/11	IT Based Supply Networks

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
The student should be enabled on the one side to be aware of challenges of Supply Networks and on the other hand to develop relevant business processes.

Class syllabus:
In this lecture many IT objectives which are essential for solving IT issues within Supply Networks in the automotive industry will be introduced in order to solve complex issues in this domain..The core of the lecture focuses on the fundamentals of Web Services (SOA, Semantic Web, Ontology, OWL) and Cloud Computing (SaaS, PaaS, IaaS) in relation to Supply Networks. Besides the principles of collaboration will be explained as: Requirements of CNOs (Collaborative Networked Organizations) on Collaboration and Interoperability, Different forms of CNOís (Supply Networks, Collaborative Networked Organisations, and Business Ecosystems), Different kinds of services (Horizontal/vertical Services respectively Enterprise Collaboration/Interoperability Services). Another topic will be the introduction of recursive network models using graph cut and superposition of rooted trees. Event oriented triggering and specific security issues are also more specific issues. Furthermore designing of collaboration processes similar to the Kanban process based on collaboration containers will be introduced. Especially security issues in the context of cloud computing will intensively discussed with the specific focusing on federated identity management and the introduction of security assertion mark-up language.
This lecture is accompanied by exercises in which platform, framework, and modelled (partly in ARIS, partly in BPMN) business processes for supply networks will be provided on the cloud. These provided business processes should on the one hand be implemented by applying the most appropriate technology and on the other hand interfaces to ERP systems should be integrated with implemented business processes

Recommended literature:
CHAPPELL, D. Enterprise Service Bus. OíReilly, 2004.
KRAFZIG, D., BANKE, K., SLAMA, D. Enterprise SOA. Prentice Hall, 2005.

MARKS, E., BELL M. Service-Oriented Architecture. New Jersey : John Wiley & Sons, Inc., 2006

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
77,78	22,22	0,0	0,0	0,0	0,0

Lecturers: Dr. Josef Withalm

Last change: 27.09.2017

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-262/15	IT Infrastructure Security

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Project, written test
Approximate grading scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with many practical problems arising in security of IT infrastructure. They will know possible solutions, their properties and underlying principles, and they will be able to choose the most appropriate solutions.

Class syllabus:
Security failures and their causes, selected practical examples
Web application security (code injection, data manipulation)
Security of rich internet applications (Javascript, HTML5, etc.)
Access control in operating systems (models, SELinux etc.)
Availability protection (backups, RAID)
Secure programming
Selected topics in network security (RADIUS, DNSSEC, VPN, ...)

Recommended literature:
Web Hacking: Attacks and Defense / Stuart McClure, Saumil Shah, Shreeraj Shah Addison-Wesley Professional 2002
Course notes published at the course website
Current publications related to the course material
Secure Coding in C and C++ (2nd Edition) / Robert C. Seacord. Addison-Wesley Professional; 2 edition (April 12, 2013)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 50

A	B	C	D	E	FX
8,0	46,0	14,0	2,0	20,0	10,0

Lecturers: doc. RNDr. Martin Stanek, PhD., RNDr. Jaroslav Janáček, PhD., RNDr. Richard Ostertág, PhD., RNDr. Michal Rjaško, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-164/00	IT Quality Management

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
exam
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Strategic Impact of quality and to become aquainted with a system development method including Software Quality Procedures. Furthermore the student will be familiarized with methods to assess on the one hand the Quality of SW products and on the other hand the maturity of SW development organizations.

Class syllabus:
In the first part of the lecture the perception of quality will be introduced. Especially the following main issues will be tackled:
- Strategic impact of Quality
- Q-control against Q-Assurance
- Q-standards and Q-Awards
- Q-costs
- Liability issues
- Leadership, Human Factors and Work organizations

The second part focuses on SW quality assurance which bases on a development process.Besides project planning and administrating all important quality related procedures as
- Requirement management
- Reviews
- Tests
- Configuration management
- Estimation of expenditures.
- Case tools

will be introduced.
Furthermore methods to assess the quality of SW products as
- SW Quality Evaluation
- Quality in Use

- Certifying Hypermedia Links for Internet Applications
- SW Acquisition Process
will be presented.
Finally methods to assess a SW development organization including
- ISO 9001
- CMMI(Capability Maturity Model Integration)
- BSC(Balanced Score cards)
will be revealed.

Recommended literature:
Norman E.Fenton: SW-Metrics
Tom de Marco: Peopleware
Bell, Morrey, Pugh: SW-Engineering
Grady, Caswell: SW-Metrics establishing a company-wide Program
Tom de Marco: Controlling SW-Projects

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 36

A	B	C	D	E	FX
55,56	25,0	13,89	2,78	2,78	0,0

Lecturers: Dr. Josef Withalm

Last change: 29.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-223/15	IT Security Management

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-520 Introduction to Information Security

Course requirements:
Written exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Student will be familiar with information security management in an organization, identification of its security needs, evaluating significance of threats, procedures of various types which should be coordinated to achieve overall defence with minimal resource use. They will know laws and standards relevant to information security.

Class syllabus:
Goals of information security in an organization. Introduction of an information security management system. Risk management (identification, evaluation, control). Security policy, data classification. Operational Continuity planning, disaster plans, operation recovery. Change management. Management of security incidents. Legislative requirements for information security and their implementation in practice. Standards for management, evaluation and implementation of information security. Monitoring and evaluation of effectiveness and efficiency of information security management, Audits. Certification of systems and products.

Recommended literature:
Documents from series NIST SP-800 and published standards of the German BSI available on the web.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 47

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-106/00	Informatics and Society

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will understand social, moral, legal and economic ramifications of the profession.

Class syllabus:
Current social aspects of informatics.
Case studies of social, moral, legal and economic ramifications of the informatics profession.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 284

A	B	C	D	E	FX
94,37	1,06	2,11	0,7	0,7	1,06

Lecturers: prof. RNDr. Branislav Rovan, PhD., Mgr. Ľubor Illek

Last change: 13.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI+KAI/2-MXX-131/21	International Team-based Research Project

Educational activities:
Type of activities: course / independent work
Number of hours:
per week: 3 **per level/semester:** 39 / 30s
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: active participation in research in an international student team (25%), presentation of work in a workshop (25%), scientific article (50%)
Indicative evaluation scale: A 90 %, B 80 %, C 70 %, D 60 %, E 50 %
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will learn in the team to agree on a common research topic, formulate research questions, determine research methods for the problem, collect and evaluate data, discuss their findings, present research results to the professional public, analyze and evaluate the scientific work of their colleagues, prepare a scientific article suitable for publication

Class syllabus:
- Research methodology
- Design and implementation of a research project in an international group (preferably interdisciplinary)
- Methods and tools for collaboration in virtual space, collaboration in science and practice
- Academic writing, presentation of research results through scientific articles; objectives, content and structure of scientific articles; forms of academic publication, publication forums and evaluation of their quality
- Quality assurance and feedback - peer review
- Communication of results through posters or conference presentations

Recommended literature:
- Teachers' own electronic study materials published on the course website or in the Moodle system
- Gavora, Peter a kol. 2010. Elektronická učebnica pedagogického výskumu. [online]. Bratislava : Univerzita Komenského, 2010. Dostupné na: http://www.e-metodologia.fedu.uniba.sk/ ISBN 978–80–223–2951–4.

- Tharenou, P., Donohue, R. and Cooper, B., 2007. Management research methods. Cambridge University Press.
- Topping, A., 2015: The Quantitative-Qualitative Continium. In: Gerrish, K. and Lathlean, J., The Research Process in Nursing, p. 159-172
- Williamson, K. and Johanson, G. eds., 2017. Research methods: Information, systems, and contexts. Chandos Publishing.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 5

A	B	C	D	E	FX
60,0	0,0	0,0	0,0	40,0	0,0

Lecturers: doc. RNDr. Zuzana Kubincová, PhD., doc. RNDr. Martin Homola, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-132/15	Introduction to Distributed Algorithms

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Exam: written and optionally oral
Scale of assessment (preliminary/final): 10/90

Learning outcomes:
Students will be familiar with basic theoretical results for communication problems in distributed systems.

Class syllabus:
The course covers distributed system models with communication based on message passing. We will analyse and compare variants of the classical model (synchronous/asynchronous, anonymous, with various topological information) on different network topologies. We will study communication and time complexity of typical problems (termination, leader elections, spanning tree etc) in different models. We will present basic results in message routing and algorithms for fault tolerance (consensus problem under different types of failure). We will define models of current communication technologies, compare them to the classical model and present typical results.

Recommended literature:
Introduction to distributed algorithms / Gerard Tel. Cambridge : Cambridge University Press, 2000
An introduction to distributed algorithms / Valmir C. Barbosa. Cambridge, Mass. : MIT Press, 1996
Distributed algorithms / Nancy A. Lynch. San Francisco : Morgan Kaufmann, 1996
Introduction to parallel algorithms and architectures : Arrays. Trees. Hypercubes / F. Thomson Leighton. USA : Morgan Kaufmann Publishers, Inc., 1992

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 43

A	B	C	D	E	FX
39,53	25,58	20,93	0,0	4,65	9,3

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-187/15	Introduction to Theory of Programming

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Written tests
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Student will be familiar with principles of program abstraction with the goal to analyse properties of program control structures independently from a particular program interpretation, principles and methods of proving correctness of program correctness, foundations of formal semantics of imperative and recursive programming languages

Class syllabus:
Program schemes
- basic notions - standard scheme, interpretation, Herbrand interpretations, properties of program schemes
- decidability of basic properties - basic undecidability results, subclasses of schemes with decidable properties (free and Yanov schemes)
- comparative schematology - relations between classes of standard, structured and recursive schemes, partially interpreted schemes

Program correctness
- partial and total correctness - invariants, inductive formulas, weakest precondition, strongest postcondition
- proof methods - Floyd method, Hoare-like proof systems, used induction principles, proving properties of recursive programs
- systematic development of correct programs

Semantics of programs and languages
- program meaning - principles of operational, denotational and axiomatic semantics
- semantic domains - algebraic structure, construction of domains
- formal semantics - operational and denotational semantics of imperative and recursive programs, types and semantics
- comparison of operational and denotational semantics - imperative programs, recursive programs (correctness of computational rules, criteria of correctness)

Recommended literature:
Zohar Manna. Mathematical theory of computation. McGraw Hill, 1974
Prívara, I.: Úvod do teórie programovania, lecture notes, 2014 – pdf version

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 14

A	B	C	D	E	FX
42,86	7,14	7,14	7,14	28,57	7,14

Lecturers: RNDr. Igor Prívara, CSc.

Last change: 13.09.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-163/00	Kolmogorov Complexity

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
ongoing evaluation: essay, problem solving, written exam.
estimated grading curve: A 90%, B 80%, C 70%, D 65%, E 60%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic understanding of the notion of Kolmogorov complexity and its properties, mostly focused on the application in proofs of various lower bounds.

Class syllabus:
Kolmogorov complexity - definition, basic properties, incompressibility method, information content; Randomness testing; Applications in complexity theory, graph theory, broadcasting algorithms; Variations of Kolmogorov complexity

Recommended literature:
An Introduction to Kolmogorov Complexity and Its Applications / Ming Li, Paul Vitányi. New York : Springer, 2008;
Information and randomness : An algorithmic perspective / Cristian S. Calude ; forewords by Gregory J. Chaitin and Arto Salomaa. Berlin : Springer, 2002;
slides from the lectures;
papers chosen according to the interest of students

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 35

A	B	C	D	E	FX
45,71	14,29	5,71	11,43	11,43	11,43

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MMN-255/00	Linear Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites: FMFI.KAG/1-MMN-160/00 - Linear Algebra and Geometry (2) or FMFI.KAG/1-INF-156/10 - Algebra (2)

Course requirements:
Continuous assessment: exercises: 30%, project: 20%, Exam: 50%.
The student must obtain at least half of the points for the exercises in order to pass the final written exam.
Grading: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), Fx (50-0).
Scale of assessment (preliminary/final): 50% / 50%

Learning outcomes:
Students master the basics of linear programming (simple models of real problems, relevant geometry, duality theory and some of the simplex methods, the idea of interior point methods). At the same time, they will gain an overview of possible applications of linear programming in other scientific fields, or in practice.

Class syllabus:
Geometric approach to solving linear programming problems. Practical problems formulation in the form of LP. Fundamentals of convex analysis (convex set, polyhedrons, extreme points, separation theorems, theorems of alternatives). Basic solutions and connection with extreme points. Simplex method (basic idea, two-phase and dual simplex method). Duality theory (duality and complementarity theorems) and its applications and economic interpretation. Idea of interior point methods for linear programming, central path. Modern applications of linear programming.

Recommended literature:
Mária Trnovská: Lineárne programovanie, online text.
Lineárne programovanie / Ján Plesník, Jitka Dupačová, Milan Vlach. Bratislava : Alfa, 1990
Robert J. Vanderbei: Linear programming: Foundations and extensions, Kluwer Academic Publishers, 2000.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 526

A	B	C	D	E	FX
13,88	17,68	19,58	20,72	22,05	6,08

Lecturers: doc. RNDr. Mária Trnovská, PhD., Mgr. Andrej Badík

Last change: 16.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-166/15	MSc Project

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Oral exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will be able to actively use their skills and knowledge for completing larger projects.

Class syllabus:
The aim of the project is to involve students in teamwork on larger projects. Students have the opportunity to choose an existing, usually open-source, project to which they will contribute. They will gain the opportunity to gain practical experience with the application of software engineering best practices, with the management and life cycle of larger projects and, last but not least, with communication within heterogeneous development teams. Students present their experiences and compare them with each other.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 106

A	B	C	D	E	FX
97,17	0,94	0,0	0,0	0,0	1,89

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-INF-150/15	Machine Learning

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Recommended prerequisites:
(1-INF-115 Algebra (1) OR 1-AIN-152 Linear Algebra) AND 2-INF-175 Probability and Statistics

Course requirements:
homework assignments (30%), project (30%), final exam (40%)
To pass the exam, a student has to get at least half of the points on the exam.
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
Students will be familiar with basic machine learning techniques, and they will be able to use these techniques in practical applications.

Class syllabus:
Supervised machine learning (linear and generalized linear regression, neural networks, classification with support vector machines, kernel methods, discrete classifiers). Machine learning theory (statistical model of machine learning, bias-variance trade-off, overfitting and underfitting, PAC learning, VC dimension estimates). Unsupervised machine learning (clustering, self-organizing maps, principal component analysis). Reinforcement learning. Ensemble learning (bagging, boosting).

Recommended literature:
The elements of statistical learning : Data mining, inference, and prediction / Trevor Hastie, Robert Tibshirani, Jerome Friedman. New York : Springer, 2009
Pattern recognition and machine learning / Christopher M. Bishop. New York : Springer, 2006
Machine learning / T. M. Mitchell. New York : McGraw Hill, 1997
Biological sequence analysis : Probabilistic models of proteins and nucleic acids / Richard Durbin ... [et al.]. Cambridge : Cambridge University Press, 1998

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 198

A	B	C	D	E	FX
42,42	16,16	12,63	8,08	7,07	13,64

Lecturers: Mgr. Vladimír Boža, PhD., Mgr. Marek Šuppa, doc. Mgr. Tomáš Vinař, PhD.

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-165/00	Management Software Projects

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
Exam
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will understand techniques, trends and problems in software project management. The course emphasizes a practical view and provides examples which help students understand roles of individual team members and how they help to achieve the desired outcome.

Class syllabus:
Basic principles, lifecycle and methods of managing a software project. Goals, scope, cost, duration, quality, and risks of a project. Project planning methods. Team management, motivation. Impact of technologies,people and financial resources on project management. Use of metrics and forecasting.

Recommended literature:
Berkun, S: The Art of Project Management, O'Reilly Media, Inc., 2005
DeMarco, T: Peopleware: Productive Projects and Teams, Dorset House Publishing Company, 1999
Cockburn, A: Agile Software Development, Addison-Wesley, 2002
Royce, W: Software Project Management, Addison-Wesley, 1999
Augustine, S: Managing Agile Projects, Prentice Hall PTR, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 100

A	B	C	D	E	FX
13,0	39,0	34,0	8,0	6,0	0,0

Lecturers: Mgr. Peter Neurath

Last change: 29.10.2015
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MMN-210/15	Mathematical Analysis (3)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites: FMFI.KMANM/1-MMN-150/15 - Mathematical Analysis (2) or FMFI.KMANM/1-INF-150/00 - Mathematical Analysis (2)

Antirequisites: FMFI.KMANM/1-MMN-210/00

Course requirements:
For the semester, the student can get 20 points for exercises, 30 points for written exams, the final written exam has a weight of 30 points, the final oral exam weighs 20 points. The student must obtain at least 40 points from the exercises, written exams and the final written exam, at least 15 points from the final written exam and at least 10 points from the final oral exam. Grading: A (91-100 points), B (81-90 points), C (71-80 points), D (61-70 points), E (51-60 points), Fx (0-50 points).
Weight of the ongoing / final assessment: ongoing assessment 50% (20% exercise + 30% written exams) / 50% (30% final written exam, 20% final oral exam).
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Absolvent of the subject has basic knowledge of metric spaces and differential calculus of scalar and vector functions of several variables and is capable of applying it for solving particular tasks in differential calculus of functions of several variables.

Class syllabus:
1. Metric spaces
n-dimensional Euclidean space Rn, convergence and Cauchy sequence in Rn, metric spaces, convergence in a metric space, complete metric space, normed space, Banach space, Banach fixed point theorem, topology of metric spaces, compact and convex sets, convex functions
2. Limit and continuity
limit and continuity in metric spaces, continuous vector functions, continuity and compactness
3. Differential calculus of functions of several variables
partial derivatives, gradient, total differential and differentiability, derivative of a compound function, directional derivative, Taylor theorem and local extrema
4. Implicitly given functions

implicit function theorem, constrained extrema, Lagrange multipliers

Recommended literature:

J. Filo, K. Rostás: 2^2 × 13 prednášok z matematickej analýzy, Vydavateľstvo UK, 2016.
W. Walter: Analysis 2. Springer, Berlin, 2002.
W. Rudin: Principles of mathematical analysis. McGraw-Hill, Singapore, 1976.
B. P. Demidovich: Problems in Mathematical Analysis, Beekman Books, 1975.
I. Kluvánek, L. Mišík, M. Švec: Matematika 1. SVTL, Bratislava, 1966.
W. Fleming: Functions of Several Variables, Springer-Verlag, New York-Heidelberg-Berlin 1997.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 217

A	B	C	D	E	FX
5,07	10,6	16,59	26,27	35,94	5,53

Lecturers: doc. RNDr. Zbyněk Kubáček, CSc., RNDr. František Jaroš, PhD., RNDr. Kristína Rostás, PhD.

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI+KMANM/2-INF-177/15	Mathematical Analysis (3)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Test, homework assignments, writen exam
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be able to solve basic differential equations and tasks involving metric spaces and analyze functions of multiple variables.

Class syllabus:

Recommended literature:
Zbierka príkladov z obyčajných diferenciálnych rovníc / Nikolaj Michajlovič Matvejev. Bratislava : SVTL, 1964
Matematická analýza III / Mária Barnovská, Kristína Smítalová. Bratislava : Univerzita Komenského, 1991
Matematika : diel 1 : pre štúdium technických vied / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Alfa, 1971
Matematika pre štúdium technických vied : 2. diel / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Alfa, 1970

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 12

A	B	C	D	E	FX
41,67	8,33	16,67	8,33	16,67	8,33

Lecturers: Mgr. Katarína Boďová, PhD., RNDr. Kristína Rostás, PhD.

Last change: 13.09.2015
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-114/00	Mathematical Logic

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-210 Introduction to Mathematical Logic

Course requirements:
Test, final exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will be familiar with concepts from mathematical logic needed for studying artificial intelligence and for reading artificial intelligence literature.

Class syllabus:
Propositional calculus, semantics, Hilbert systems, Gentzen systems, tableaux, metatheorems, predicate calculus, language, semantics, Hilbert systems, Gentzen systems, tableaux, metatheorems, theory of recursive functions, automated theorem proving.

Recommended literature:
Logika : Neúplnost, složitost a nutnost / Vítězslav Švejdar. Praha : Academia, 2002
Klasická matematická logika / Antonín Sochor. Praha : Karolinum, 2001

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 229

A	B	C	D	E	FX
27,95	16,59	19,65	13,97	20,52	1,31

Lecturers: doc. RNDr. Eduard Toman, CSc.

Last change: 28.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KI/1-BIN-301/15	Methods in Bioinformatics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Homework assignments (30%), group project (10%), weekly quizzes (10%), written exam (50%). Grades: A 90%, B 80%, C 70%, D 60%, E 50%. More information on the course website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with basic problems and methods in bioinformatics; they will be able to choose an appropriate method for a given biological problem and to interpret its results.

Class syllabus:
Basic concepts from molecular biology, algorithms and machine learning. Sequencing and assembling genomes. Gene finding. Sequence alignment. Evolutionary models and phylogenetic trees. Comparative and population genomics. RNA structure. Motif finding and gene expression analysis. Protein structure and function. Selected current topics.
Students of computer science programs will focus on computer science methods and mathematical modeling of the covered problems.

Recommended literature:
Biological sequence analysis : Probabilistic models of proteins and nucleic acids / Richard Durbin ... [et al.]. Cambridge : Cambridge University Press, 1998
Understanding bioinformatics / Marketa Zvelebil, Jeremy O. Baum. New York : Garland Science, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 149

A	B	C	D	E	FX
32,89	18,79	20,13	14,77	5,37	8,05

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD., Mgr. Askar Gafurov, PhD.
Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-INF-126/00	Models of Concurrent Systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Student is familiar with fundamental models of parallel and concurrent processes as well as various specification and verification tools and techniques.

Class syllabus:
- Models of concurrent and parallel processes – mainly process algebras (Petri nets,..)
- Standard process algebra, process algebras as a keystone of specification(verification) languages
- Calculus of concurrent systems (CCS) – fundamental constructs and pronciples
- Operational semantics CCS – labeled transition systems, rewriting rules
- Sign semantics and bisimulation – definitions and relationship
- Properties of bisimulation – congruency, expansion theorem
- Axiomatization – axiom systems characterizing weak and strong bisimulation
- Bisimulation characterization based on temporal logic – logic description, characterization theorems
- Pi-calculus and its generalization – pi-calculus as a semantic model of mobile computing, polyadic pi-calculus
- Petri nets – definitions, relation to process algebras
- Henessy-Milner logic and modal Mu-calculus

Recommended literature:
Milner,R.: Communication and Concurrency. Prentice Hall, 1989
Henessy,M.C.: Algebraic Theory of Processes. MIT Press, 1988
Olderog,E.R.: Nets, Terms and Formulas. Cambridge University Press,1991
Stirling,C.: Modal and Temporal Properties of Processes. Springer Verlag, 2002

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
34,78	17,39	21,74	8,7	8,7	8,7

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-IKV-189/16	Natural Language Processing

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
The students will acquire knowledge and practical experience in the field of natural language processing. They will know how to effectively apply the underlying theory from probability, statistics, computational linguistics, and machine learning, to perform tasks involving unstructured text, such as spelling correction, text generation, sentiment analysis, information extraction, and question answering.

Class syllabus:
(1) Text Processing.
(2) Language Modeling (n-grams), Spelling Correction.
(3) Text Classification (Naive Bayes), Sentiment Analysis.
(4) Named Entity Recognition (HMM, MaxEnt), Relation Extraction.
(5) POS Tagging, Parsing.
(6) Information Retrieval.
(7) Meaning Extraction, Question Answering.

Recommended literature:
Speech and Language Processing, 2nd Edition / Daniel Jurafsky, James H Martin. Upper Saddle River : Prentice Hall, 2008

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
86,21	6,9	6,9	0,0	0,0	0,0

Lecturers: Mgr. Marek Šuppa

Last change: 23.09.2017
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-132/15	Neural Networks

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-480/00

Course requirements:
individual projects during the semester.
Final written-oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
After completing the course will student understands the basic principles of connectionism (neural networks) know the basic models of neural networks and know their usefulness when solving various tasks (eg. Pattern recognition, classification, time series prediction, memorizing patterns and others). Lectures are combined with computer simulations exercises in Python.

Class syllabus:
Introduction, inspiration from biology, brief history, NS with logical neurons.
Binary / continuous perceptron: the concept of learning with the teacher, classification of patterns.
Single-layer NS: linear self-association, classification, error functions.
Multilayer perceptron: error backpropagation method, training and test set, generalization, model selection, validation.
Modifications of gradient methods, second order optimization, regularization. Optimization problems.
Unsupervised learning, feature extraction, principal component analysis, self-organizing map, data visualization.
Sequence data modeling: forward NS, relation to n-grams, partially and completely recurrent models, SRN model, BPTT algorithms, RTRL.
Expansion of hidden representation: NS with radial basis functions (RBF), echo state network (ESN).
Deep learning, convolutional neural networks: introduction.
Modern recurrent NS: autoencoders, GRU, LSTM.
Hopfield model: deterministic dynamics, attractors, autoassociative memory.

Stochastic recurrent NS models: basics of probability theory and statistical mechanics, Boltzmann machine, RBM model, Deep Belief Network.
The recent trends in NS.

Recommended literature:

Neural networks and learning machines / Simon Haykin. Upper Saddle River : Pearson education, 2009
Úvod do teórie neurónových sietí / Vladimír Kvasnička ... [et al.]. Bratislava : Iris, 1997
Neural networks (slajdy k prednáškam), Igor Farkaš, Knižničné a edičné centrum FMFI UK v Bratislave, 2011.
Goodfellow I., Bengio Y., Courville A. (2016). Deep Learning. MIT Press.
Zhang A. et al. (2020). Dive into Deep Learning. An interactive deep learning book with code, math, and discussions, based on the NumPy interface.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 151

A	B	C	D	E	FX
29,8	15,89	14,57	10,6	11,26	17,88

Lecturers: prof. Ing. Igor Farkaš, Dr.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MAT-240/00	Numerical Mathematics (1)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2.

Educational level: I., II.

Prerequisites: FMFI.KMANM/1-MAT-150/00 - Mathematical Analysis (2) or FMFI.KMANM/1-INF-150/00 - Mathematical Analysis (2) or FMFI.KAMŠ/1-DAV-102/20 - Calculus (1)

Course requirements:
Preliminary assessment: 2 written tests 10 points each, individual work 10 points
Final examination: written exam for 50 points and oral exam for 20 points
Indicative assessment scale: A 88%, B 78%, C 68%, D 58%, E 48%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students will be able to solve numerical mathematics problems from mathematical analysis, algebra, applied mathematics and practice using computers and available software.

Class syllabus:
Position of numerical mathematics in solving of real problems. Concept of stability. Errors and computational arithmetic. The solution of nonlinear equations. Solution of system nonlinear equations. Approximation of functions. Interpolation - Lagrange's and Newton's interpolation polynomial and their errors. Optimal selection of interpolations point. Chebyshev polynomials. Linear and cubic splines. The least square method. Numerical differentiation. Numerical quadrature.
The solution of simultaneous linear equations.

Recommended literature:
Lars Eldén, Linde Wittmeyer-Koch: Numerical analysis An Introduction ACADEMIC Press, INC, San Diego, 1990.
J. Babušíková, M. Slodička, J. Weisz : Numerická matematika , UK Bratislava, 1999 (skriptá).
S. Míka: Numerické metody algebry, SNTL Praha 1982.
P. Přikryl: Numerické metody matematické analýzy, SNTL Praha 1985.
A. Ralston: A first course in numerical analysis, New York, 1965.
R. L.Burden, J. D. Faires: Numerical Analysis, Cengage Learning, 2010.

Languages necessary to complete the course:

Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 884

A	B	C	D	E	FX
18,21	23,64	23,08	15,5	16,97	2,6

Lecturers: Mgr. Jela Babušíková, PhD., RNDr. Patrik Mihala, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-222/00	Object Analysis and Modelling

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-516 Principles of Software Design

Course requirements:
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students are able to use the UML visual modelling language and to apply it to modelling software systems, especially in the analysis stage of development.

Class syllabus:
Introduction to O-O analysis and visual modelling, general modeling mechanisms in UML, use-case modelling, modelling classes, modelling composite structures, modelling interactions, modelling state automata, modelling activities, modelling components, UML extensibility mechanisms, advanced modelling mechanisms.

Recommended literature:
Unified Modeling Language: Superstructure. Version 2.1.1, formal/2007-02-05, OMG, February 2007.
M. Fowler: UML Distilled: A Brief Guide to the Standard Object Modeling Language. 3rd Edition, Addison-Wesley, September 2003.
G. Booch, J. Rumbaugh, and I. Jacobson: Unified Modeling Language User Guide. 2nd ed., Addison-Wesley, May 2005.
M. J. Chonoles and J. A. Schardt: UML 2 for Dummies. Wiley, July 2003.
D. Pilone and N. Pitman: UML 2.0 in a Nutshell. 2nd ed., O'Reilly, June 2005.
T. A. Pender: UML Weekend Crash Course. Wiley, April 2002.
P. Kimmel: UML Demystified. McGraw-Hill Osborne Media, October 2005.
D. Pilone: UML 2.0 Pocket Reference. O'Reilly, March 2006.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 411

A	B	C	D	E	FX
32,6	15,09	19,22	12,65	14,84	5,6

Lecturers: doc. RNDr. Robert Lukoťka, PhD.

Last change: 04.10.2016

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-286/15	Ontologies and Knowledge Engineering

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-646/00

Course requirements:
Semester: project (60pts), ongoing work assessment (20pts)
Exam: written exam (20pts)
Min. passing requirements: 50% from the semester and 50% from the exam
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 80/20

Learning outcomes:
Students become acquainted with ontologies, with their role in data representation and sharing, with ontological representation and query languages, and with ontology engineering methodologies. They will also get acquainted with Semantic Web standards and with the principles and possibilities of publishing data in the Linked Open Data network, as well as the use of such data in knowledge-based applications.

Class syllabus:
- Ontologies and their applications
- Well-known ontologies
- Ontological representation languages (RDF, RDF Schema, OWL)
- Ontologies and databases
- SPARQL query language
- Linked Open Data network
- Ontology engineering
- Applications of ontologies in informatics

Recommended literature:
Staab, S. and Studer, R. eds., 2010. Handbook on ontologies. Springer Science & Business Media.
Allemang, D. and Hendler, J., 2011. Semantic web for the working ontologist: effective modeling in RDFS and OWL. Elsevier.
Selected relevant recent scientific papers.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Martin Homola, PhD., Mgr. Júlia Pukancová, PhD.

Last change: 30.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MMN-261/10	Ordinary Differential Equations

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites: FMFI.KMANM/1-MMN-150/15 - Mathematical Analysis (2) or FMFI.KMANM/1-INF-150/00 - Mathematical Analysis (2)

Course requirements:
interim and final exam:
continuous examination: tests(45%); final exam: written test(35%) and oral examination(20%)
Grades:
100-91% (A); 90-81% (B); 80-71% (C); 70-61% (D); 60-51% (E), 50-0% (Fx)
Scale of assessment (preliminary/final): 45/55

Learning outcomes:
The graduate of the course will know the importance of differential equations for applications, the creation of mathematical models, gain skills in solving differential equations and acquire basic knowledge from the introduction to the theory of ordinary differential equations.

Class syllabus:
The notion of the differential equation, solution and initial value problem. The creation of mathematical models, methods of integration. Linear n-th order differential equations. The existence and uniqueness of solutions (the Picard´s theorem). Applications in natural and economic sciences.

Recommended literature:
1. Greguš, M., Švec, M., Šeda, V.: Obyčajné diferenciálne rovnice, Bratislava, Alfa, 1985.
2. Kluvánek, I., Mišík, L., Švec, M.: Matematika II, SVTL Bratislava, 1961.
3. Bock, I., Marko, Ľ. : Diferenciálne rovnice, skriptá, FEI STU, 1993.
4. D. K. Arrowamith, C. M. Place: Ordinary Diferrential Equations. A Qualitative Approach with Applications, Chapman and Hall, London, New York 1982.
5. E. A. Coddington, N. Levinson: Theory of Ordinary Differential Equations, McGraw-Hill Book Company, Inc., New York, Toronto, London 1955.

Languages necessary to complete the course:
slovak

Notes:

Past grade distribution
Total number of evaluated students: 387

A	B	C	D	E	FX
12,66	6,98	15,25	20,16	37,73	7,24

Lecturers: RNDr. František Jaroš, PhD., prof. RNDr. Milan Medveď, DrSc.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-110/00	Physical Education and Sport (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of the students´ game skills in collective sports: basketball, volleyball, football, floorball and hockey. Mastering of the basic technique of a particular sport discipline in other sports. In paddling, basic training on still and slightly flowing water. Development of coordination skills, improvement of articular mobility and cardiovascular system.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1657

A	B	C	D	E	FX
98,37	0,6	0,06	0,0	0,0	0,97

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-120/00	Physical Education and Sport (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of offensive and defensive game combinations and playing with modified rules in collective sports such as basketball, volleyball, football, floorball, hockey. Command of elements of higher difficulty in locomotion skills (swimming - crawl stroke, breast stroke, butterfly stroke, trampoline jumping and aerobics – practicing of areobics compositions, bodybuilding – development of the main muscle groups, paddling on running water. Testing of the level of physical fitness and coordination skills.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1557

A	B	C	D	E	FX
98,52	0,39	0,06	0,06	0,06	0,9

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Branislav Nedbálek, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-210/00	Physical Education and Sport (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
To improve offensive and defensive game combinations in collective sports. Practicing of tactical and technical elements in individual sports. Compensatory exercises to correct wrong body posture. Stretching. Competition rules in sport disciplines.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1281

A	B	C	D	E	FX
98,75	0,47	0,08	0,0	0,0	0,7

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-220/00	Physical Education and Sport (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Sport training for Faculty Championships in a selected sport with modified rules. Selection of sport-talented students into teams of the Faculty Sport League, University League of Bratislava Faculties, and participation in sport events of the Faculty and University.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1110

A	B	C	D	E	FX
98,47	0,45	0,09	0,09	0,09	0,81

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Branislav Nedbálek, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-206/15	Physical-based Animations and Mathematical Modeling

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation: assignments, homeworks,
Exam: final exam, oral exam
Evaluation scale: A 92%, B 84%, C 76%, D 68%, E 60%
For the semester, the student can get 10% for exercises, 60% for homework, final written exam with a weight of 30% oral final exam is voluntary with a weight of 20%. The student must solve at least 30% of each homework in order to pass the final written exam. Grading: 92-100 A, 84-91 B, 76-83 C, 68-75 D, 60-67 E. Details on the course page.
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will learn the basic techniques of simulation particle systems, solving systems of ordinary differential equations numerically, the object collision detection. Understand the principles of dynamics of rigid bodies and the principle of the creation of computer animation and camera movement. Understand how to construct physics engine for games or video animation.

Class syllabus:
Particle systems, motion equations of first order integration methods to calculate the speed and position, state vector system, external forces, restrictive conditions - constraints, response forces, particle collisions - plane.
Numerical solution of differential equations, Euler method, Runge-Kuta method, stability criteria to select the time step.
Lagrange method without networks, modeling and animation point cloud, SPH, deformation
Animation mobility, spline interpolation to animate movement, reparametrisation spline curves by length, and orientation quaternion interpolation of two or more quaternion.
Collision detection, Z buffer algorithm, necessary and sufficient conditions when there are two bodies in a collision, parting line, hierarchy envelopes force response (Response Forces). Three phase detection wide, medium and narrow.
Dynamics of rigid bodies, equations of motion, velocity, acceleration, angular velocity and angular acceleration, inertia matrix.
Procedurárne animation, systems and methods for creating computer animation liquids, fire, smoke.

Computer animation in games and in the film industry. Other applications of computer animation with further developments in the field of computer animation using physical effects.

Recommended literature:

Visual Quantum mechanics : Selected Topics with Computer/Generated animations of Quantum-Mechanical phenomena / Bernd Thaller. New York : Springer, 2000

Computer facial animation / Frederic I. Parke, Keith Waters. Wellesley : A. K. Peters , 1996

SIGGRAPH tutorialy dostupné na http://dl.acm.org/dl.cfm?CFID=412417535&CFTOKEN=50913605

Dostupné texty k prednáške. https://dai.fmph.uniba.sk/w/Physical-based_Animations_and_Mathematical_Modeling_Material

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution

Total number of evaluated students: 341

A	B	C	D	E	FX
34,6	18,18	12,61	14,08	7,92	12,61

Lecturers: prof. RNDr. Roman Ďurikovič, PhD., Mgr. Andrej Mihálik, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-272/16	Practicum in Machine Learning

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 5

A	B	C	D	E	FX
80,0	0,0	0,0	0,0	20,0	0,0

Lecturers: Ing. Roman Gavuliak, PhD.

Last change: 02.05.2016

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/1-INF-315/14	Principles of Reverse Engineering

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-526 (or similar course about assembler programming on x86 architectures), 1-INF-127 (or similar course about C/C++ programming)

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Completing the course the student will gain basic knowledge about reverse engineering techniques and their application in practice in the analysis of software functionality.

Class syllabus:
Basic principles and tools - disassembling, debugging, decompilation virtualization; Reverse engineering on Window platform - Portable Executable format, Windows API; Anti-debugging tricks: run-time compression, obfuscations; RE of Java and .NET applications; RE on Android, Mac, and Linux platforms; basics of secure programming - security vulnerabilities, exploits

Recommended literature:
Dennis Yurichev: Reverse engineering for beginners (online: http://beginners.re/RE_for_beginners-en.pdf)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 50

A	B	C	D	E	FX
46,0	16,0	16,0	4,0	8,0	10,0

Lecturers: Ing. Róbert Lipovský

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-133/00	Probabilistic Methods

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
During semester: none.
Examination period: exam (60 points) and oral examination (60 points).
Grading scale: A: more than 110pts, B: more than 100pts, C: more than 90pts, D: more than 80pts, E: more than 72pts. Student has to get at least 20pts from the exam.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will understand basic principles and applications of probabilistic methods in discrete mathematics, and they will be able to solve combinatorial problems using Markov and Chebyshev inequalities.

Class syllabus:
Bound and asymptotic formulas for binomial coefficients, Stirling and Wallis‘s formula, Markov’s inequality, Chebyshev’s inequality. Applications of both inequalities, random graphs, evaluation of random graphs, random Boolean functions, optimization tasks on final sets.

Recommended literature:
Probability and random processes / Geoffrey R. Grimmett, David R. Stirzaker. Oxford : Oxford University Press, 2001
Probabilistic graphical models : Principles and techniques / Daphne Koller, Nir Friedman. Cambridge, Mass. : MIT Press, 2009

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 17

A	B	C	D	E	FX
94,12	0,0	0,0	0,0	5,88	0,0

Lecturers: doc. RNDr. Eduard Toman, CSc.
Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/2-INF-175/18	Probability and Statistics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAMŠ/2-INF-175/15

Course requirements:
written tests, final exam
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will be familiar with mathematical foundations of probability and statistics. They will be able to solve common types of problems involving probability and conduct simple statistical analyses.

Class syllabus:
Definition of probabilistic model and basic properties of probabality, conditional probability, Bayes theorems, random variables, random vectors and their characteristics, limit theorems, introduction to Markov chain theory, probabilistic theory of information, regression model with normally distributed errors, introduction to theory of parameter estimation and statistical hypothesis testing

Recommended literature:
Pravdepodobnosť a matematická štatistika : Štatistické analýzy / František Lamoš, Rastislav Potocký. Bratislava : Univerzita Komenského, 1998
Zbierka úloh zo základov teórie pravdepodobnosti / Radoslav Harman, Erika Hönschová, Ján Somorčík. Bratislava : PACI, 2009
Electronic course notes published on the course web site

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 170

A	B	C	D	E	FX
32,94	9,41	16,47	16,47	16,47	8,24

Lecturers: doc. Mgr. Radoslav Harman, PhD., doc. Mgr. Lenka Filová, PhD.
Last change: 13.05.2018
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-184/15	Programming Languages

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-225 Programming (3)

Course requirements:
Midsemester test, endsemester homework.
Written practical programming exam and theoretical oral exam.
Assessment (approx.): A 92%, B 84%, C 76%, D 68%, E 60%.
More detailed information is available on the website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be able to faster learn a new programming language, because the course will familiarize them with basic programming paradigms, language constructs and theoretical concepts underlying programming languages.

Class syllabus:
Of the programming paradigms, the lecture deals mainly with functional programming (imperative, object-oriented and declarative programming student already knows from other subjects). Among language constructions and concepts, we will mention pattern mathing, closures, lazy evaluation, pure functions, type classes, algebraic data types, recursion schemes, functors, monads, macro-hygiene, static and dynamic typing and more. These topics will be illustrated mainly in the Haskell and the Racket programming languages.

Recommended literature:
Simon Thompson. Haskell: The Craft of Functional Programming. Addison-Wesley Professional, 2011, ISBN-13: 978-0201882957.
Miran Lipovaca. Learn You a Haskell for Great Good!: A Beginner's Guide. No Starch Press, 2011, ISBN-13: 978-1593272838.
Bartosz Milewski. Category Theory for Programmers. 2019, ISBN-13: 978-0464243878.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 89

A	B	C	D	E	FX
40,45	10,11	17,98	12,36	7,87	11,24

Lecturers: RNDr. Richard Ostertág, PhD., Mgr. Adrián Goga

Last change: 28.06.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-954/15	**Course title:** Programming and Information Systems
Number of credits: 4	
Educational level: II.	
Prerequisites: FMFI.KI/2-INF-500/11 - Databases and FMFI.KI/2-INF-144/15 - Compilers and (FMFI.KI/2-INF-222/00 - Object Analysis and Modelling or FMFI.KI/2-INF-226/22 - Principles of Software Design (3)) and FMFI.KI/2-INF-183/15 - Computer Networks (2) and FMFI.KI/2-INF-145/15 - Creating Internet Applications and FMFI.KI/2-INF-184/15 - Programming Languages	
Course requirements: Oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: Students will consolidate their knowledge and skills acquired during Master studies. They will understand relationships between different areas and their broader context.	
Class syllabus: Oral exam from the selected area of computer science. The focus of the exam is defined by the prerequisites of the exam. The syllabus of the exam, announced in advance, is guided by the syllabi of individual prerequisite courses, but it is not strictly constrained by them.	
State exam syllabus:	
Languages necessary to complete the course: Slovak, English	
Last change: 09.11.2015	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-109/15	Programming of Parallel and Distributed Systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
excercises, exam
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 80/20

Learning outcomes:
Graduates of the course will be acquainted with the issues of parallel and distributed programming. They will get acquainted with the basic algorithms used in practice, as well as with methods how to prove the correctness or effectiveness of algorithms. They will gain an overview of basic parallel and distributed architectures, a brief overview of various paradigms and programming languages.

Class syllabus:
At the beginning, students will be introduced to a simple way to write algorithms for parallel and distributed computing, so that these notations are applicable to different types of architectures. They will also gain the basics of logic that will be used to express and prove the properties of programs. Then they will get acquainted with the basic architectures of parallel and distributed systems. The core of the course consists of selected basic algorithms of parallel and distributed systems (eg Shortest path, Reader-problémWriters problem, Evening philosophers, Meeting coordination, Drinking philosophers, Sorting, Faulty channels, Global snapshots, Stable feature detection, Byzantine agreement). Alternatively, their zones may expand in line with developments in the field. At the end of the course there will be an overview of different programming languages and paradigms and logics.

Recommended literature:
Parallel program design : A Foundation / K. Mani Chandy , Jayadev Misra. Reading : Addison-Wesley, 1988 An introduction to parallel algorithms / Joseph Jájá. Boston : Addison-Wesley, 1992 C. Stirling: Modal and Temporal Properties of Processes, Springer 2001 Elektronické poznámky k prednáške, http://ii.fmph.uniba.sk/~gruska/udpp/Beziacaudppprednaska2014.pdf

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 264

A	B	C	D	E	FX
25,38	18,18	21,97	23,11	6,44	4,92

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-173/13	Quantum Information Processing

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
ongoing evaluation: exam
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The students get acquainted with the basics of the quantum information theory.

Class syllabus:
1. Introduction and history
2. Pure quantum state and superposition principle
3. Quantum measurement and uncertainty relations
4. Mixed quantum states
5. Time evolution of quantum systems
6. Two quantum systems - EPR paradox
7. Bell inequalities
8. Quantum information
9. Basic quantum protocols
10. Experimental realization and decoherence
11. Indistinguishability principle and elementary particles

Recommended literature:
John Preskill: Lecture Notes on Quantum Information,
http://www.theory.caltech.edu/people/preskill/ph229/#lecture
M. A. Nielsen and I. L. Chuang: Quantum computation and Quantum Information, Cambridge university press (2000)

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 45					
A	B	C	D	E	FX
48,89	17,78	15,56	11,11	6,67	0,0
Lecturers: doc. RNDr. Martin Plesch, PhD.					
Last change: 14.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-135/15	Randomized Algorithms

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-167 Computational Complexity and Computability

Course requirements:
Homework assignments, written and oral exam
Scale: A 90%, B 80%, C 70%, D 65%, E 60%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Student will be familiar with using random numbers and properties of objects as an approach to designing efficient algorithms and solving computationally hard problems. They will be able to apply presented methods in design and probabilistic analysis of algorithms.

Class syllabus:
Analysis of randomized algorithms. Models and basic complexity classes. Techniques for design of randomized algorithms. Applications. Derandomization. More on complexity classes.

Recommended literature:
Randomized algorithms / Rajeev Motwani, Prabhakar Raghavan. New York : Cambridge University Press, 1995
Probability and computing : Randomized algorithms and probabilistic analysis / Michael Mitzenmacher, Eli Upfal. New York : Cambridge University Press, 2005
Computational complexity : A modern approach / Sanjeev Arora, Boaz Barak. New York : Cambridge University Press, 2009

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 22					
A	B	C	D	E	FX
36,36	4,55	27,27	4,55	13,64	13,64
Lecturers: doc. RNDr. Dana Pardubská, CSc.					
Last change: 21.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-161/00	Russian Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian. The language level is A1.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject provides a course in Russian language for beginners.

Recommended literature:
The textbook: : Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 707

A	B	C	D	E	FX
58,56	16,55	11,03	4,38	1,84	7,64

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-162/00	Russian Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject continues the program of Russian language (1) and provides a course of Russian for beginners.

Recommended literature:
Textbook: Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 421

A	B	C	D	E	FX
65,08	15,68	8,79	3,8	0,95	5,7

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-261/00	Russian Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 200

A	B	C	D	E	FX
70,5	17,5	8,5	2,5	0,0	1,0

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-262/00	Russian Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 144

A	B	C	D	E	FX
75,69	13,19	6,94	2,78	0,69	0,69

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-271/18	Selected Technologies for Data Analysis

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KI/2-INF-271/16

Course requirements:
2 home projects, 10% each
exam
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
After completion, the students will learn the basics of big data and some related programming paradigms and tools. The student will learn the basics of MapReduce Framework and specific open source implementation, Apache Hadoop. The aim of this part of the course is for the graduate to be able to deal with non-trivial problems in Hadoop. The student will also get acquainted with other applications from the so - called Big Data ecosystem, such as are Zookeeper, Kafka or Hive, which offer solutions to specific problems such as communication or processing of data warehouses.

Class syllabus:
Hadoop: basics of MapReduce Frameworku, Distributed filesystem (HDFS, GFS), Local aggregation, secondary sorting, Inverted Index, PBFS, PageRank, Database join;
Miscellaneous: Zookeeper, Kafka, Zeppelin, Hive, Ambari

Recommended literature:
Jason Venner: Pro Hadoop;
Zookeeper Documentation;
Kafka Documentation

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 9					
A	B	C	D	E	FX
33,33	11,11	33,33	11,11	11,11	0,0
Lecturers: Mgr. András Varga, PhD.					
Last change: 14.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-237/00	Selected Topics in Data Structures

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Homework assignments during the semester are worth 15 points, final exam 15 points. Overall grade is at least 26 points A, at least 22 points B, at least 17 points C, at least 13 points D, at least 9 points E.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with a wider variety of efficient data structures, They will be able to design and analyze their variants and choose an appropriate data structure for a given problem. They will be able to work with scientific literature in this area and to compare data structures experimentally.

Class syllabus:
Amortized complexity, splay trees. Data structures for text data (suffix trees and arrays), lowest common ancestor, succinct data structures, Bloom filters, priority queues, structures for external memory, other current topics.

Recommended literature:
Algorithms on strings, trees, and sequences : Computer science and computational biology / Dan Gusfield. New York : Cambridge University Press, 1997
Introduction to algorithms / Thomas H. Cormen ... [et al.]. Cambridge, Mass. : MIT Press, 2001
Peter Brass. Advanced Data Structures. Cambridge University Press 2008.
Selected current scientific articles on related topics.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 106

A	B	C	D	E	FX
26,42	15,09	10,38	18,87	25,47	3,77

Lecturers: Mgr. Jakub Kováč, PhD., doc. Mgr. Bronislava Brejová, PhD.
Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-273/16	Selected Topics in Information Security

Educational activities:
Type of activities: course
Number of hours:
per week: **per level/semester:** 27s
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
active participation, test
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completion the students will know the principles and methods of resolving security incidents, penetrations testing of systems, security monitoring, forensic analysis and malicious code analysis

Class syllabus:
CSIRT/CERT teams, Security events and security incidents; Security incidents handling process, support tools; vulnerability of software products, CVE identifier; Verification of selected security incidents - phishing (email and website), vulnerabilities; Handling standard types of security incidents; Penetration testing of websites; Security monitoring, security events, correlation, SIEM solutions; Device hardening - Windows, Linux, Network elements; On-site incident response; Forensic analysis of workstations; Malware analysis in incident handling; Infrastructure penetration testing

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
66,67	22,22	0,0	11,11	0,0	0,0

Lecturers: Mgr. Lukáš Hlavička, RNDr. Jaroslav Janáček, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-156/00	Selected Topics in Theory of Languages

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-215 Formal languages and automata (1), 2-INF-186 Formal languages and automata (2)

Course requirements:
Oral exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will understand theory of formal languages at different levels of abstraction.

Class syllabus:
Abstract families of languages, their properties and relation to automata. Unconventional models and descriptions of languages.

Recommended literature:
S. Ginsburg: Algebraic and Automata theoretic properties of Formal Languages, North Holland, 1976
Current conference articles

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 34

A	B	C	D	E	FX
82,35	8,82	8,82	0,0	0,0	0,0

Lecturers: prof. RNDr. Branislav Rovan, PhD.

Last change: 14.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI+KAI/2-AIN-505/10	Seminar in Bioinformatics (1)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-BIN-301 or 2-AIN-501 Methods in Bioinformatics

Course requirements:
Active participation (20%), preparation of a presentation (20%), presentation (60%). Grades A: 90+, B: 80+, C: 70+, D: 60+, E: 50+. More information on the course website.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be familiar with advances in bioinformatics and related disciplines. They will gain experience working with research papers.

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:
Current publications in research journals and conferences

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 50

A	B	C	D	E	FX
56,0	10,0	18,0	0,0	0,0	16,0

Lecturers: doc. Mgr. Tomáš Vinař, PhD., doc. Mgr. Bronislava Brejová, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KI/2-AIN-506/10	Seminar in Bioinformatics (2)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-BIN-301 or 2-AIN-501 Methods in Bioinformatics

Course requirements:
Active participation (20%), preparation of a presentation (20%), presentation (60%). Grades A: 90+, B: 80+, C: 70+, D: 60+, E: 50+. More information on the course website.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be familiar with advances in bioinformatics and related disciplines. They will gain experience working with research papers.

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:
Recent publications in scientific journals and conferences.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
75,68	13,51	2,7	2,7	0,0	5,41

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KI/2-AIN-251/10	Seminar in Bioinformatics (3)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-BIN-301 or 2-AIN-501 Methods in Bioinformatics

Course requirements:
Active participation (20%), preparation of a presentation (20%), presentation (60%). Grades A: 90+, B: 80+, C: 70+, D: 60+, E: 50+. More information on the course website.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be familiar with advances in bioinformatics and related disciplines. They will gain experience working with research papers.

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:
Current publications in research journals and conferences

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 20

A	B	C	D	E	FX
75,0	10,0	15,0	0,0	0,0	0,0

Lecturers: doc. Mgr. Tomáš Vinař, PhD., doc. Mgr. Bronislava Brejová, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI+KAI/2-AIN-252/10	Seminar in Bioinformatics (4)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-BIN-301 or 2-AIN-501 Methods in Bioinformatics

Course requirements:
Active participation (20%), preparation of a presentation (20%), presentation (60%). Grades A: 90+, B: 80+, C: 70+, D: 60+, E: 50+. More information on the course website.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be familiar with advances in bioinformatics and related disciplines. They will gain experience working with research papers.

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:
Current publications in research journals and conferences

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 22

A	B	C	D	E	FX
86,36	0,0	13,64	0,0	0,0	0,0

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-169/00	Seminar in Informatics (1)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 24

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD., doc. RNDr. Dana Pardubská, CSc.

Last change:

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-170/00	Seminar in Informatics (2)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD., doc. RNDr. Dana Pardubská, CSc.

Last change: 02.06.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-130/00	Service Oriented Architectures - Principles and Technologies

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
ongoing evaluation: project, exam
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
introduction to the service-oriented technologies

Class syllabus:
1. General introduction to service-oriented architectures
2. Business process modeling and its software aspects
3. Integration middleware and related standards (CORBA, DCOM, .Net, J2EE, ...)
4. Business to Business (B2B) integration tools
5. Web services and their advanced aspects (orchestration, semantics capture)
6. Enterprise Service Bus - containers, services, processes, communication
7. Use of specific tools in the field of service-oriented architectures

Recommended literature:
CHAPPELL, D. Enterprise Service Bus. Oâ€™Reilly, 2004., KRAFZIG, D., BANKE, K., SLAMA, D. Enterprise SOA. Prentice Hall, 2005., MARKS, E., BELL M. Service-Oriented Architecture. New Jersey: John Wiley & Sons, Inc., 2006

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 79

A	B	C	D	E	FX
40,51	22,78	21,52	6,33	5,06	3,8

Lecturers: Dr. Josef Withalm, Mgr. Pavol Mederly

Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-171/20	Slovak Language for Foreign Students (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1).

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
47,83	0,0	0,0	0,0	0,0	52,17

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-172/20	Slovak Language for Foreign Students (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1) and this course is a follow up course to the Slovak language course 1.

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 22

A	B	C	D	E	FX
81,82	0,0	4,55	0,0	0,0	13,64

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-271/20	Slovak Language for Foreign Students (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 2.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-272/20	Slovak Language for Foreign Students (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 3.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-AIN-470/15	Specification and Verification of Programs

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-470/00

Course requirements:
Preliminary assessment: two tests 60%.
Final exam: test 40%.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
The course develops students' ability to demonstrate the correctness of programs, formally specify the required properties and proving them using various methods, particularly structural induction. Graduates gain knowledge of a particular formalization of recursive programs, proving their properties within a single logical theory Peano arithmetic. They also get hands-on experience with the specification and verification of a large number of programs.

Class syllabus:
1. Declarative Programming. Primitive recursion. Recursion with measure. Iterative recursion. Recursion on notation. Pairing function and arithmetization. Structural recursion.
2. Specification-verification System. Peano Arithmetic. Mathematical induction. Extensions of arithmetic. Derived induction principles: complete induction, measure induction, structural induction.
3. Data Structures. Strings. Lists. Basic operations over lists. Sorting of lists. Applications of lists. Binary trees. Basic operations over binary trees. Binary search trees. Applications of trees. Symbolic expressions. Interpreter of programming language. Universal function.

Recommended literature:
[1] Specification and Verification of Programs / Ján Komara. Online.
[2] Introduction to Declarative Programming / Ján Kľuka. In Slovak. Online.

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 58

A	B	C	D	E	FX
18,97	1,72	6,9	8,62	32,76	31,03

Lecturers: doc. RNDr. Damas Gruska, PhD., Ing. Ján Komara, PhD., Mgr. Ján Kľuka, PhD.

Last change: 22.09.2017

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-115/17	Sports in Natur (1)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Acquisition and development of basic motor skills and abilities in selected sports: skiing and snowboarding. Mastering the correct technique of performing individual movements, which are necessary for skiing and snowboarding.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: skiing, snowboarding. The lessons in the courses are focused on the development of basic and special movement skills and mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 83

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD.

Last change: 16.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-116/18	Sports in Natur (2)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%.
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Creating a positive and lasting relationship with physical activity. Acquisition and mastery of basic motor skills and abilities in outdoor sports: windsurfing, beach volleyball, water tourism - river rafting, hiking and other sports according to interest. Training and improving the technique needed for the sports.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: water tourism - river rafting, windsurfing, beach volleyball, hiking and other hobby sports. The lessons in the courses are focused on the development of basic and special movement skills and, mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ will provide sports equipment.

Past grade distribution
Total number of evaluated students: 50

A	B	C	D	E	FX
94,0	0,0	0,0	0,0	0,0	6,0

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký
Last change: 16.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-285/17	Symbolic Programming and LISP

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary assessment: homeworks, test, projects.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To acquaint students not only with the programming language LISP, but also with programming paradigms like data and procedure abstraction, functional programming, symbolic programming, and object-oriented programming. Graduates gain knowledge how to design and construct interpreters/compilers of LISP-like programming languages.

Class syllabus:
1. Procedure Abstraction:
basic expressions, compound procedures, high level procedures.
2. Data Abstraction:
basic data types, symbolic data, structured data, procedural data.
3. Modularity, Objects and Local State:
environment model, representing local state, stream as lists with delayed evaluation.
4. LISP Interpreter:
metainterpreter, strict and lazy evalutation, nondeterministic evaluation.
5. LISP Compiler:
register machines, register machine simulator, storage allocation, compilation.

Recommended literature:
Hal Abelson and Jerry Sussman and Julie Sussman. Structure and Interpretation of Computer Programs. MIT Press, second edition, 1996.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Ing. Ján Komara, PhD.

Last change: 18.11.2021

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-955/15	**Course title:** Theoretical Computer Science
Number of credits: 4	
Educational level: II.	
Prerequisites: FMFI.KI/2-INF-186/15 - Formal Languages and Automata (2) and FMFI.KI/2-INF-155/00 - Combinatorial Structures and FMFI.KI/2-INF-221/15 - Approximation of Optimisation Problems and FMFI.KI/2-INF-237/00 - Selected Topics in Data Structures and FMFI.KI/2-INF-135/15 - Randomized Algorithms and FMFI.KI/2-INF-174/15 - Graph Theory and FMFI.KI/2-INF-121/15 - Computability Theory and (FMFI.KAMŠ/1-DAV-201/20 - Fundamentals of Probability and Statistics or FMFI.KAMŠ/2-INF-175/18 - Probability and Statistics)	
Course requirements: Oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: Students will consolidate their knowledge and skills acquired during Master studies. They will understand relationships between different areas and their broader context.	
Class syllabus: Oral exam from the selected area of computer science. The focus of the exam is defined by the prerequisites of the exam. The syllabus of the exam, announced in advance, is guided by the syllabi of individual prerequisite courses, but it is not strictly constrained by them.	
State exam syllabus:	
Languages necessary to complete the course: Slovak, English	
Last change: 10.11.2015	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-224/15	Theory of Information and Theory of Coding (1)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Written and oral exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students are familiar with basics of information theory and coding theory, fundamental limits of communication over a channel and data compression. They know various compression methods and can compare their efficiency.

Class syllabus:
Fundamentals of information theory, relative entropy, mutual information. Communications channel and its models. Channel capacity. Physical aspects of information communication. Source coding. Variable-length codes, prefix codes, Kraft–McMillan theorem. Quasi-optimal and optimal codes. Codes for Markov sources. Predictive coding. Compression limits. Dictionary coders.

Recommended literature:
D. MacKay: Information Theory, Inference, and Learning Algorithms, Cambridge University Press (http://www.inference.phy.cam.ac.uk/itprnn/book.pdf)
D. Olejár, M.Stanek Úvod do teórie kódovania (http://new.dcs.fmph.uniba.sk/index.php/tk)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 68

A	B	C	D	E	FX
66,18	10,29	17,65	4,41	0,0	1,47

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-225/15	Theory of Information and Theory of Coding (2)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites: FMFI.KI/2-INF-224/15 - Theory of Information and Theory of Coding (1)

Course requirements:
Written and oral exam
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Student will understand problems related to data transmission data through noisy communication channels and the relationship between information transfer rate and probability of correct decoding of the transmitted information. They will be familiar with the most important types of error correcting codes, and they will be able to construct and use them for encoding and decoding information.

Class syllabus:

Recommended literature:
D.Olejár, M.Stanek Úvod do teórie kódovania (http://new.dcs.fmph.uniba.sk/index.php/tk)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 42

A	B	C	D	E	FX
88,1	9,52	0,0	2,38	0,0	0,0

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-122/00	Theory of Parallel Computations

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-INF-215 Formal language and automata (1), 2-INF-186 Formal languages and automata (2)

Course requirements:
Oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will understand the power and limitations of parallel computation from the point of view of computational complexity.

Class syllabus:
Particular parallel models (grammars, automata)
Models of computation in the 2nd class, mutual simulations
Parallel computation theses.
Complexity classes and problems efficiently solvable in parallel (NC, P-complete problems)
Limitations of parallel computations

Recommended literature:
Handbok of Theoretical Computer Science, Vol. 1 (ed. J. van Leeuwen).
Ruzzo, Greenlaw, Tompa – Limits of parallel computers: P-complete problems.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 151

A	B	C	D	E	FX
43,05	19,87	11,26	7,95	7,28	10,6

Lecturers: prof. RNDr. Branislav Rovan, PhD.
Last change: 21.06.2022
Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-991/15	**Course title:** Thesis Defence
Number of credits: 10	
Educational level: II.	
Prerequisites: FMFI.KI/2-INF-922/00 - Diploma Thesis Seminar (3)	
Course requirements: Submission of the Master thesis and its defence Scale of assessment (preliminary/final): 0/100	
Learning outcomes: Students demonstrate their ability to creatively solve a given problem. They can summarize state of the art in a selected topic, write a longer technical document and defend it before a committee of experts.	
Class syllabus: The Master thesis is the culmination of the Master program in Computer Science. The topic of the thesis can be a research or technical problem in mathematics or computer science, or analysis, design and implementation of a software application. The thesis topics are assigned towards the end of the first semester of the Master program. During the remaining semesters the student works on the thesis topic and writes the thesis. The thesis is submitted and defended in the last semester of the study program. The student receives credits for the thesis after a successful defence.	
State exam syllabus:	
Languages necessary to complete the course: Slovak, English	
Last change: 10.11.2015	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-176/15	Unix for System Administrators

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Practical assignments (both during the semester and on final exam)
Approximate grading scale: A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
After completing the course the students will know the principles of UNIX system administration and they will be able to practically carry out the basic duties of a system administrator.

Class syllabus:
users, groups, passwords
access permissions for files and directories, ACL
filesystem structure
character and block devices
special filesystem objects (symlink, pipe)
mounting and unmounting of filesystems to the directory hierarchy (mount, umount, /etc/fstab)
creating filesystems
system startup and shutdown - /etc/inittab, runlevels
job scheduling (cron, at, batch)
TCP/IP configuration (ifconfig, route)
network services (/etc/services, /etc/inetd.conf, /etc/protocols, /etc/hosts, ...)
DNS – client (/etc/resolv.conf)
DNS – server
NFS
Firewall
SystemD
Assumptions:
good user-level knowledge of UNIX systems, directory hierarchy navigation, creating and editing files (vi, joe), shell programming (sh/bash), commands find, grep, cat, cut, ls, awk.

Recommended literature:

Course notes provided on the course website, freely available electronic materials

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 164

A	B	C	D	E	FX
12,8	35,98	30,49	12,2	5,49	3,05

Lecturers: RNDr. Jaroslav Janáček, PhD., Ing. Dušan Bernát, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-275/18	Unstructured Talks on Structures: Chapters in Mathematics for Computer Scientists (1)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
homework assignments (30%), oral exam (70%)
Grading scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will come to a better apprehension of the role of abstract mathematics in (both theoretical and applied) computer science and gain a deeper understanding of some familiar concepts and methods. They will get acquainted with selected branches of mathematics important for their computer science applications, which are not covered as a part of the standard curriculum, or which are only covered marginally.

Class syllabus:
Matrix interpretation of some problems on graphs. Semirings, complete semirings, and matrices over them. Finite automata over semirings. Formal power series and their combinatorial meaning. Formal power series in several non-commutative variables. Weighted automata and their applications. Eigenvalues and eigenvectors, their applications, Jordan canonical form. Eigenvalues of directed graphs, enumeration of walks. The Perron-Frobenius theory of nonnegative matrices. Calculus of finite differences. Solution methods for difference equations and their systems of selected types. Spectral graph theory and its applications in computer science.

Recommended literature:
Electronic materials at the course website.
Grafy a jejich aplikace / Jiří Demel. Prague : Academia, 2002
Handbook of Weighted Automata / Manfred Droste, Werner Kuich, Heiko Vogler (eds.). Heidelberg : Springer, 2009
Lineárna algebra a geometria / Pavol Zlatoš. Bratislava : Albert Marenčin PT, 2011
Linear Algebra Done Right, 3rd ed. / Sheldon Axler. Heidelberg : Springer, 2015
Nonnegative Matrices / Henryk Minc. New York : Wiley, 1988
An Introduction to Difference Equations, 3rd ed. / Saber Elaydi. New York : Springer, 2005

Algebraic Graph Theory / Chris Godsil, Gordon Royle. New York : Springer, 2001
A First Course in Network Theory / Ernesto Estrada, Philip Knight. Oxford : Oxford University Press, 2015
An Introduction to the Theory of Graph Spectra / Dragoš Cvetković, Peter Rowlinson, Slobodan Simić. Cambridge : Cambridge University Press, 2010

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 15.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-276/18	Unstructured Talks on Structures: Chapters in Mathematics for Computer Scientists (2)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Course requirements:
homework assignments (30%), oral exam (70%)
Grading scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will gain familiarity with some more advanced branches of mathematics in connection to their computer science applications.

Class syllabus:
Metric spaces, the Banach fixed point theorem and its applications. Basic notions of universal algebra, varieties of algebras, Birkhoff's variety theorem. Pseudovarieties of finite algebras, Reiterman's theorem. Recognition of formal languages by monoids and semigroups, syntactic monoids and syntactic semigroups, the Myhill-Nerode theorem. Basics of the structural theory of general and finite semigroups based on Green's relations. Varieties of formal languages and their connection to pseudovarieties of finite monoids and semigroups via the Eilenberg correspondence. Algebraic theory of recognisable languages.

Recommended literature:
Electronic materials and links at the course website.
Introduction to Topology and Modern Analysis / George F. Simmons. New York : McGraw-Hill, 1963
Matematická analýza II / Jiří Brabec, Bohuslav Hrůza. Prague : SNTL, 1986
Universal Algebra / P. M. Cohn. Dordrecht : D. Reidel Publishing Company, 1981
Finite Semigroups and Universal Algebra / Jorge Almeida. Singapore : World Scientific, 1994
Elements of Automata Theory / Jacques Sakarovitch. Cambridge : Cambridge University Press, 2009
Fundamentals of Semigroup Theory / John M. Howie. Oxford : Clarendon Press, 1995
Automata and Languages / John M. Howie. Oxford : Clarendon Press, 1991
Varieties of Formal Languages / J. E. Pin. London : North Oxford Academic Publishers, 1986

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 15.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/1-AIN-168/15	Web Applications in Praxis

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 238

A	B	C	D	E	FX
31,09	18,91	17,65	17,65	9,66	5,04

Lecturers: Mgr. Martin Krupa, Mgr. Robert Mráz, Mgr. Ing. Matúš Tuna, PhD., Mgr. Endre Hamerlik

Last change: 22.09.2017

Approved by: