Course descriptions

TABLE OF CONTENTS

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 4

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: 0

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

Lecturers: Mgr. Jakub Kováč, PhD.

Last change: 13.05.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
Form of the course: on-site learning

Number of credits: 4

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: 74

A	B	C	D	E	FX
62,16	13,51	12,16	8,11	2,7	1,35

Lecturers: RNDr. Michal Forišek, PhD.

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
homeworks, projects, written exam
A 91%, B 82%, C 73%, D 64%, E 55%
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:
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 education Asia : Publishing House of Electronics Industry, 2010
Image processing : The fundamentals / Maria Petrou, Costas Petrou. Chichester : John Wiley, 2010

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 40

A	B	C	D	E	FX
7,5	27,5	37,5	15,0	2,5	10,0

Lecturers: RNDr. Zuzana Černeková, PhD., RNDr. Paula Budzáková

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
Form of the course: on-site learning

Number of credits: 4

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: 25

A	B	C	D	E	FX
64,0	20,0	8,0	4,0	0,0	4,0

Lecturers: RNDr. Jaroslav Janáček, PhD.

Last change: 24.04.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 14
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: 44

A	B	C	D	E	FX
50,0	27,27	9,09	2,27	4,55	6,82

Lecturers: RNDr. Martin Sleziak, PhD.

Last change: 15.01.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites: FMFI.KI/2-INF-277/18 - Complex Analysis for Computer Scientists or FMFI.KMANM/1-MAT-416/15 - Theory of Complex Variable Functions

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): 20/80

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.

Class syllabus:
Formal power series and generating functions. Enumeration of labelled and unlabelled structures, Pólya's theory. The methodology of analytic combinatorics. The symbolic method of specifying combinatorial structures, its connection to formal languages. Generating functions as analytical objects, their singularities, Pringsheim's theorem. Asymptotic analysis of coefficients of rational and meromorphic functions. Singularity analysis. Coefficients of algebraic functions. The saddle-point method. Multivariate analytic combinatorics. Applications.

Recommended literature:
Electronic materials on the course website.
Analytic Combinatorics / Philippe Flajolet, Robert Sedgewick. Cambridge : Cambridge University Press, 2009
Analytic Combinatorics in Several Variables / Robin Pemantle, Mark C. Wilson. New York : Cambridge University Press, 2013
Enumerative Combinatorics, vol. 1 / Richard P. Stanley. Cambridge : Cambridge University Press, 1997
Enumerative Combinatorics, vol. 2 / Richard P. Stanley. Cambridge : Cambridge University Press, 1999
Asymptotic Methods in Analysis / Nicolaas Govert de Bruijn. Amsterdam : North-Holland, 1961

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

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

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 26.06.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: Ing. Alexander Šimko, PhD.

Last change: 23.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Final exam (written and oral) and project
Scale of assessment (preliminary/final): 0/100

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: 58

A	B	C	D	E	FX
29,31	15,52	18,97	6,9	12,07	17,24

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.08.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

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. Agents, types of agents, agent properties. Browse - informed strategies. 2. Search - informed strategies. Games. 3. Logical agents, propositional and predicate database knowledge. 4. Inference of the predicate in the knowledge base. 5. Planning. 6. likelihood naive Bayesian classifier, Bayesian network. 7. Bayesian network, exact and approximate inference in Bayesian network. 8. Using Bayesian networks in artificial intelligence. Introduction to the use of probability theory in games. 9. Monte Carlo method in games.
10. The classic theory of time series, time series models. 11. Use of Bayesian networks inference in time series with uncertainty. 12. Markov priocesy, Kalman filter, the use of artificial intelligence. 13. Decision Theory: simple and complex decision-making, decision trees.

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:

Notes:

Past grade distribution
Total number of evaluated students: 53

A	B	C	D	E	FX
30,19	13,21	15,09	20,75	18,87	1,89

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

STATE EXAM DESCRIPTION

University: Comenius University in 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 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: prof. RNDr. Rastislav Kráľovič, PhD.	

COURSE DESCRIPTION

University: Comenius University in Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-151/17	Biologically Motivated Theory of Languages

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 42
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: 0

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

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 17.05.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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 90%, B 80%, C 70%, D 60%, E 50%
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: 12

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

Lecturers: doc. RNDr. Daniel Olejár, PhD., doc. RNDr. Martin Stanek, PhD., RNDr. Ján Mazák, PhD.
Last change: 13.05.2018
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 89

A	B	C	D	E	FX
44,94	16,85	17,98	5,62	11,24	3,37

Lecturers: doc. RNDr. Daniel Olejár, PhD.
Last change: 14.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 82

A	B	C	D	E	FX
71,95	15,85	6,1	6,1	0,0	0,0

Lecturers: prof. RNDr. Martin Škoviera, PhD.

Last change: 13.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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
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: 22

A	B	C	D	E	FX
31,82	18,18	22,73	13,64	9,09	4,55

Lecturers: RNDr. Richard Ostertág, PhD., RNDr. Peter Kostolányi, PhD.

Last change: 14.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
written test, 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. Complex functions and their derivatives, holomorphic functions. Power series, Taylor series, analytic functions. Multifunctions. Integration in the complex plane, Cauchy's integral theorem, Cauchy's integral formula and its generalisation. Analytic continuation of a function, singularities and their classification, Laurent series. Residues. Algebraic functions and Puiseux series. Elements of the theory of several complex variables. Introduction to analytic number theory.

Recommended literature:
Electronic materials on the course website.
Introduction to Complex Analysis / H. A. Priestley. Oxford : Oxford University Press, 2003
Complex Variables: Introduction and Applications / Mark J. Ablowitz, Athanassios S. Fokas. New York : Cambridge University Press, 2003
Complex Analysis / Lars Ahlfors. New York : McGraw-Hill, 1979
Complex Analysis / Eberhard Freitag, Rolf Busam. Heidelberg : Springer, 2009
Complex Analysis 2 / Eberhard Freitag. Heidelberg : Springer, 2011

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

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

Lecturers: RNDr. Peter Kostolányi, PhD.

Last change: 26.06.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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:
Two written tests
Scale of assessment (preliminary/final): 100/0

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: 22

A	B	C	D	E	FX
68,18	9,09	13,64	9,09	0,0	0,0

Lecturers: RNDr. Michal Forišek, PhD.

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Assessment: evaluation
Preliminary assessment: paper
Final assessment: 60% Final evaluation examination (oral)
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: 141					
A	B	C	D	E	FX
29,08	10,64	16,31	13,48	12,77	17,73
Lecturers: doc. RNDr. Pavel Chalmovianský, PhD.					
Last change: 03.09.2015					
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.					

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
The course gives the foundation of computer logic needed for further study of knowledge representation and artificial intelligence. Listeners will be familiar with ontology and logick programming. The course focuses on the following aspects of the representation (syntax, semantics, resulting), but the main emphasis is on algorithmic aspects (resulting calculation, its accuracy and computational complexity).

Class syllabus:
- First order predicate logic (repeat)
- Description Logics (syntax, semantics, inference algorithm)
- Use of description logic (ontology and database)
- Logic Programming (syntax, minimal models, stratification, stable models, well-established models, SLDNF rezolvencia, calculation of stable models)
- Use logic programs (Prolog, ASP programming)

Recommended literature:
The description logic handbook : Theory, implementation, and applications / Edited Franz Baader ... [et al.]. Cambridge : Cambridge University Press, 2005
Handbook of knowledge representation / edited by Frank van Harmelen, Vladimir Lifschitz, Bruce Porter. Amsterdam : Elsevier, 2008
Inteligencia ako výpočet / Ján Šefránek. Bratislava : Iris, 2000

Languages necessary to complete the course:
slovensky, anglicky

Notes:

Past grade distribution
Total number of evaluated students: 52

A	B	C	D	E	FX
9,62	3,85	21,15	17,31	21,15	26,92

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

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
6,67	40,0	13,33	0,0	33,33	6,67

Lecturers: Mgr. Michal Ferko, PhD.

Last change: 13.05.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
To provide students with fundamental techniques in computer graphics.

Class syllabus:
Graphical input and output devices. Computer graphics basics: half-toning, font generation, surfaces tessellation, clipping and intersections, rasterization, area filling. Specialized data structures and object representation. Winged edges and half-edges, DCEL, meshes, B-rep, sweeping, CSG, implicit functions and F-rep. Spatial subdivision techniques, wavelets, procedural, deformable, and multiresolution techniques. Data fitting. Object reconstructions.

Recommended literature:
E. Ružický, Úvod do počítačovej grafiky, skriptá, MFF UK Bratislava, 1991
J. Žára et al., Počítačová grafika, princípy a algoritmy, Grada, Praha 1992
E. Ružický, A. Ferko, Počítačová grafika a spracovanie obrazu, Sapientia, Bratislava 1995
J. Žára, et al. Moderní počítačová grafika, Computer Press, Praha 2004

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 586

A	B	C	D	E	FX
14,16	13,31	16,38	20,82	22,18	13,14

Lecturers: RNDr. Martina Bátorová, PhD.

Last change: 16.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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:

Learning outcomes:
To provide students with the knowledge of advanced techniques for photorealistic computer graphics.

Class syllabus:
Algorithms for visibility and shadows. Radiometry, light, colors, textures. Local, global and volumetric illumination models (lighting, rendering, volumetric equation). Experimental illumination models (transparency, participating media, gamma-correction). Methods for local and global illumination. Ray-tracing, ray/object intersection, computing of energy contributions, another tracing types (path, photon). Radiosity notion and radiosity equation. Model of heat transfer. Form-factors. Basic steps in radiosity computations. Ray tracing and radiosity – rendering quality comparison.

Recommended literature:
Moderní počítačová grafika / Jiří Žára ... [et al.]. Brno : Computer Press, 2010
Matematická analýza 3 : Integrálny počet v Rn / Vladimír Ďurikovič, Roman Ďurikovič. Trnava : Univerzita sv. Cyrila a Metoda, 2008
Electronic texts by the teacher, published on the WWW page of the class.

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 265

A	B	C	D	E	FX
14,72	18,87	24,15	17,74	16,6	7,92

Lecturers: RNDr. Róbert Bohdal, PhD.

Last change: 02.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-183/15	**Course title:** Computer Networks (2)
Educational activities: **Type of activities:** lecture / practicals **Number of hours:** **per week:** 2 / 1 **per level/semester:** 28 / 14 **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: assignments, written tests, written and oral final exam 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 , ATM, IP routing protocols (BGP, OSPF, RIP, ...), advanced topics in TCP (syn-cookies, ECN, ...), advanced topics in WiFi, tunneling. Theoretical principles of data transmission, maximal bandwidth, CRC, ..., modulation techniques, data transmission - UART, USRT, synchronization Long-distance lines and multiplexing - optical networks - FDMA/TDMA/CDMA, synchronous optical networks (SDH, SONET).	
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: 50

A	B	C	D	E	FX
26,0	44,0	20,0	4,0	6,0	0,0

Lecturers: RNDr. Jaroslav Janáček, PhD.

Last change: 10.05.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

STATE EXAM DESCRIPTION

University: Comenius University in 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: prof. RNDr. Rastislav Kráľovič, PhD.	

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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-175/15 - Probability and Statistics or FMFI.KAMŠ/2-INF-175/18 - Probability and Statistics

Course requirements:

Learning outcomes:

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

Recommended literature:
Základy matematické statistiky / Jiří Anděl. Praha : Matfyzpress, 2005
An Introduction to R (available online: cran.r-project.org/doc/manuals/R-intro.pdf)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 285

A	B	C	D	E	FX
54,39	11,23	11,58	10,53	7,72	4,56

Lecturers: Mgr. Ján Somorčík, PhD.

Last change: 12.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Homework assignments, exam.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will be familiar with principles of parallel programming with shared memory and its typical applications. They will have practical experience with selected information technologies for implementing parallel programs with shared memory.

Class syllabus:
Processes and threads. Purpose of programming with processes and threads. Life cycle and scheduling of processing and threads in operating systems. Examples of thread usage.
Creating and terminating threads. Thread synchronization. Shared variables, critical sections. The problem of mutual exclusion and possibilities of addressing it. Semaphores, mutexes, condition variables. Pairwise simulations of different synchronization mechanisms in computer systems.
Threads in UNIX systems. Threads in Java. Monitor. Thread safety.. Deadlock, livelock, polling. Correctness of multithreaded programs.
Efficency of multithreaded programs. Parallel scientific computing with shared memory. Related information technologies.

Recommended literature:
Principles of Concurrent Programming / M. Ben-Ari. Englewood Cliffs : Prentice-Hall, 1982

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 19

A	B	C	D	E	FX
36,84	0,0	10,53	10,53	15,79	26,32

Lecturers: doc. Mgr. Tomáš Plachetka, Dr.

Last change: 14.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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
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: 4

A	B	C	D	E	FX
25,0	75,0	0,0	0,0	0,0	0,0

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

Last change: 10.05.2016
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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 91%, B 81%, C 72%, D 63%, E 56%
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 current technologies: client-side scripting, raster and vector client-side graphics rendering, two-way communication between the server and the client. Selected software-engineering practices: MVC design pattern, separation of presentation and content, testing. Complex application framework including user identification and authentication, access control, object-relational mapping, templates, navigation. Security of internet applications.

Recommended literature:
JavaScript profesionálně / Steven Holzner ; překlad Jan Gregor ... [et al.]. Praha : Mobil Media, 2003
CSS kaskádové styly pro webdesignéry / Marek Prokop. Brno : CP Books, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 131

A	B	C	D	E	FX
23,66	15,27	25,95	18,32	13,74	3,05

Lecturers: RNDr. Richard Ostertág, PhD.

Last change: 18.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Homewrok assignments, test, final written exam
Scale of assessment (preliminary/final): 0/100

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:
Cryptography : Theory and practice / Douglas R. Stinson. Boca Raton, Fla. : Chapman & Hall, 2006
Cryptography, An Introduction: Third Edition / Nigel Smart (http://www.cs.bris.ac.uk/~nigel/Crypto_Book/)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 47

A	B	C	D	E	FX
10,64	8,51	19,15	25,53	31,91	4,26

Lecturers: doc. RNDr. Martin Stanek, PhD.

Last change: 21.08.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
homework assignments, test, final written exam
Scale of assessment (preliminary/final): 0/100

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:
Algorithms for factorization and discrete logarithm, elliptical curves, formal definitions and proofs of cryptographic constructions, digital signature schemes with advanced properties, cryptanalysis of symmetric key ciphers, pseudorandom number generators, advanced cryptographic protocols

Recommended literature:
Introduction to modern cryptography / Jonathan Katz, Yehuda Lindell. Boca Raton, Fla. : Chapman & Hall/CRC Press, 2008
Cryptography, An Introduction: Third Edition / Nigel Smart (http://www.cs.bris.ac.uk/~nigel/Crypto_Book/)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
44,44	0,0	0,0	11,11	22,22	22,22

Lecturers: doc. RNDr. Martin Stanek, PhD.

Last change: 23.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 4

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: 8

A	B	C	D	E	FX
50,0	37,5	0,0	0,0	12,5	0,0

Lecturers: Mgr. Vladimír Boža, PhD.

Last change: 12.01.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 14 / 28
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

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: 43

A	B	C	D	E	FX
34,88	32,56	11,63	9,3	11,63	0,0

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

Last change: 06.01.2019

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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:

Learning outcomes:
Students will be familiar with mathematical theory and techniques of efficient implementation of relational, logical and deductive database systems.

Class syllabus:
Implementation of relations, partial match queries. Relational algebra - SQL machine, use of main memory, Optimization of queries, algebraic laws on query trees, Optimization of conjuctive queries. Datalog with functions, unification. Datalog query optimization. Optimization of datalog queries with recursion. Database and logic computation, optimization using magic predicates. Implementation of database management functions.
Distributed databases. Data mining.

Recommended literature:
Foundations of databases / Serge Abiteboul, Richard Hull, Victor Vianu. Reading : Addison-Wesley, 1995
Database systems : The complete book / Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom. Upper Saddle River : Prentice-Hall, 2002

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 173

A	B	C	D	E	FX
19,08	12,14	19,08	16,76	17,34	15,61

Lecturers: doc. Mgr. Tomáš Plachetka, Dr., RNDr. Ján Mazák, PhD.

Last change: 20.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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: 0

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

Lecturers: Ing. Ján Komara, PhD.

Last change: 04.05.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 273

A	B	C	D	E	FX
75,82	5,49	9,16	3,66	1,1	4,76

Lecturers: prof. RNDr. Branislav Rovan, PhD.

Last change: 29.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 235

A	B	C	D	E	FX
96,6	0,0	0,85	0,0	0,0	2,55

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

Last change: 21.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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
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: 224

A	B	C	D	E	FX
95,54	0,45	3,13	0,0	0,0	0,89

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

Last change: 23.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
written and optional oral exam
Scale of assessment (preliminary/final): 0/100

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: 177

A	B	C	D	E	FX
40,68	11,86	19,77	7,34	15,82	4,52

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

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

Learning outcomes:

Class syllabus:
The content of the course is general English.
The language level is B2/C1 (Upper-Intermediate/Lower Advanced).

Recommended literature:
Selection of materials from Inside Out Upper-Intermediate, Cutting Edge Upper-Intermediate, New English File Upper-Intermediate, British and American newspapers and journals
Recordings: authentic and semi-authentic (source: BBC, CNN, coursebook recordings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 144

A	B	C	D	E	FX
59,72	18,06	9,03	2,08	1,39	9,72

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

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

Learning outcomes:

Class syllabus:
The course is a follow-up to the Conversation Course in English (1). The content of the course is general English.
The language level is B2/C1 (Upper-Intermediate/Lower Advanced).

Recommended literature:
Selection of materials from Inside Out Upper-Intermediate, Cutting Edge Upper-Intermediate, New English File Upper-Intermediate, British and American newspapers and journals
Recordings: authentic and semi-authentic (source: BBC, CNN, coursebook recordings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 78

A	B	C	D	E	FX
64,1	20,51	6,41	1,28	0,0	7,69

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 28
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:
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. Computational complexity. Fundamental complexity classes and their properties.

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: 35

A	B	C	D	E	FX
51,43	2,86	25,71	8,57	5,71	5,71

Lecturers: prof. RNDr. Branislav Rovan, PhD., RNDr. Peter Kostolányi, PhD.

Last change: 10.05.2016
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
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: 6

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

Lecturers: RNDr. Igor Prívara, CSc.

Last change: 13.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:

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:
Pravda, Pravdová: Učebnica francúzštiny pre samoukov a kurzy, SPN Bratislava 1999, ISBN 80-08-00431-2

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 387

A	B	C	D	E	FX
41,09	21,96	21,19	9,82	2,07	3,88

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

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

Recommended literature:
Pravda, Pravdová: Učebnica francúzštiny pre samoukov a kurzy, SPN Bratislava 1999, ISBN 80-08-00431-2
Blažena Srncová: Učebnica francúzštiny pre študentov Matematicko-fyzikálnej fakulty , UK 1983
Kolektív Lingea, s.r.o.: Slovensko-francúzsky hovorník, Bratislava 2008

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 247

A	B	C	D	E	FX
36,03	26,72	21,05	10,93	2,83	2,43

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

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

Recommended literature:
Pravda, Pravdová: Učebnica francúzštiny pre samoukov a kurzy, SPN Bratislava 1999, ISBN 80-08-00431-2
Blažena Srncová: Učebnica francúzštiny pre študentov Matematicko-fyzikálnej fakulty , UK 1983
Kolektív Lingea, s.r.o.: Slovensko-francúzsky hovorník, Bratislava 2008

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 97

A	B	C	D	E	FX
36,08	28,87	22,68	7,22	1,03	4,12

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

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

Recommended literature:
Pravda, Pravdová: Učebnica francúzštiny pre samoukov a kurzy, SPN Bratislava 1999, ISBN 80-08-00431-2
Blažena Srncová: Učebnica francúzštiny pre študentov Matematicko-fyzikálnej fakulty , UK 1983
Kolektív Lingea, s.r.o.: Slovensko-francúzsky hovorník, Bratislava 2008
Zarha Lahmidi: Sciences-techniques.com, ISBN 209-0331186-0, CLE international, 2005

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 68

A	B	C	D	E	FX
36,76	35,29	19,12	2,94	1,47	4,41

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-AIN-430 Programovacie paradigmy

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
The transformation of functional programs
Functional morphisms a scheme recursion
Introduction to the lambda calculus
Properties lambda theory
Interpreter lambda calculus
typing systems
logic Kombinator
parsing
Monadic 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:

Notes:

Past grade distribution
Total number of evaluated students: 42

A	B	C	D	E	FX
52,38	4,76	28,57	4,76	9,52	0,0

Lecturers: RNDr. Peter Borovanský, PhD.

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 7

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

Lecturers: doc. RNDr. Dušan Guller, PhD.

Last change: 23.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAI/2-INF-269/15	**Course title:** Genomics
Educational activities: **Type of activities:** lecture / practicals **Number of hours:** **per week:** 2 / 1 **per level/semester:** 28 / 14 **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: Project, test Scale of assessment (preliminary/final): 100/0	
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: 26

A	B	C	D	E	FX
53,85	23,08	7,69	0,0	15,38	0,0

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

Last change: 29.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 485

A	B	C	D	E	FX
20,82	14,43	18,97	20,21	17,53	8,04

Lecturers: Mgr. Ľudovít Balko, PhD.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

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.

Recommended literature:
Vilášek, P.: Nemčina pre študentov FMFI, Na webovej stránke autora v elektronickej podobe.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 666

A	B	C	D	E	FX
32,28	29,13	21,17	9,91	2,85	4,65

Lecturers: Mgr. Alexandra Maďarová, Mgr. Marián Mancovič

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The course continues the program of German language (1). German language is taught at three levels: beginner, intermediate, advanced.

Recommended literature:
Vilášek, P.: Nemčina pre študentov FMFI, Na webovej stránke autora v elektronickej podobe.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 423

A	B	C	D	E	FX
30,5	21,99	22,93	14,66	3,78	6,15

Lecturers: Mgr. Alexandra Maďarová, Mgr. Marián Mancovič

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The subject continues the program of German language (2). It provides a course of intermediate and advanced German language.

Recommended literature:
Vilášek, P.: Nemčina pre študentov FMFI, Na webovej stránke autora v elektronickej podobe.
Aus moderner Technik und Naturwissenschaft, 1999, Max Hueber Verlag, D-85737, ISBN 3-19-001629-1

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 150

A	B	C	D	E	FX
38,0	28,0	22,0	6,67	2,67	2,67

Lecturers: Mgr. Alexandra Maďarová, Mgr. Marián Mancovič

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The subject continues the program of German language (3). It provides a course of intermediate and advanced German language.

Recommended literature:
Vilášek, P.: Nemčina pre študentov FMFI, Na webovej stránke autora v elektronickej podobe.
Vilma Václavíková: Nemčina pre študentov MFF UK, Vysokoškolský učebný text pre potrebu študentov KJP, č. 9793/1982 C VIII/2, 1983

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 78

A	B	C	D	E	FX
35,9	28,21	14,1	12,82	3,85	5,13

Lecturers: Mgr. Alexandra Maďarová, Mgr. Marián Mancovič

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
1-INF-160

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

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: 40

A	B	C	D	E	FX
32,5	15,0	22,5	17,5	12,5	0,0

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

Last change: 10.05.2016
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-238/15	Graphical Models in Machine Learning

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 56
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-INF-238/00

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 12

A	B	C	D	E	FX
50,0	25,0	16,67	0,0	8,33	0,0

Lecturers: doc. Mgr. Tomáš Vinař, PhD.

Last change: 21.09.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
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: doc. RNDr. Peter Mederly, CSc., Dr. Josef Withalm

Last change: 27.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Project, homework assignments, written test, oral exam
Approximate grading scale: A 96%, B 90%, C 80%, D 72%, E 66%
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 (Flash, Siverlight, 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: 35

A	B	C	D	E	FX
11,43	45,71	17,14	0,0	17,14	8,57

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

Last change: 18.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KI/2-INF-223/15	**Course title:** IT Security Management
Educational activities: **Type of activities:** lecture **Number of hours:** **per week:** 4 **per level/semester:** 56 **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: 38

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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 240

A	B	C	D	E	FX
93,75	1,25	2,5	0,83	0,42	1,25

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

Last change: 13.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

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

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: 27					
A	B	C	D	E	FX
37,04	25,93	14,81	0,0	7,41	14,81
Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.					
Last change: 28.10.2015					
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.					

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 9

A	B	C	D	E	FX
55,56	11,11	0,0	0,0	33,33	0,0

Lecturers: RNDr. Igor Prívara, CSc., Mgr. Michal Anderle

Last change: 13.09.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
Form of the course: on-site learning

Number of credits: 4

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: 33

A	B	C	D	E	FX
42,42	15,15	6,06	12,12	12,12	12,12

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2., 4.

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

Learning outcomes:

Class syllabus:
Introduction to linear programming. Techniques of solving LP problems by primal simplex metod. Duality in LP and its consequences. Economic interpretation of the dual problem. Modelling of operations research problems as the linearn programming problems.

Recommended literature:
W. L. Winston: Operations Research: Aplications and Algorithms, Wadsworth Pub. Co., 1997.
V. Toma: Teória a algoritmy lineárneho programovania (Theory and algorithms of linear programming), UK Bratislava, 1983.
J. Plesník: Operačná analýza (Operations analysis), UK Bratislava, 1989.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 433

A	B	C	D	E	FX
13,63	18,01	21,71	19,86	22,17	4,62

Lecturers: doc. RNDr. Vladimír Toma, PhD.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Oral exam

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

Class syllabus:
Acquiring background information, problem analysis, written and oral presentaion of the solution.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 60

A	B	C	D	E	FX
98,33	0,0	0,0	0,0	0,0	1,67

Lecturers: prof. RNDr. Rastislav Kráľovič, PhD.

Last change: 21.08.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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, project, final exam
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: 115

A	B	C	D	E	FX
38,26	16,52	16,52	9,57	6,96	12,17

Lecturers: Mgr. Vladimír Božа, PhD.

Last change: 21.09.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 93

A	B	C	D	E	FX
11,83	37,63	36,56	7,53	6,45	0,0

Lecturers: Mgr. Peter Neurath

Last change: 29.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Homework assignments, group project, written exam
Scale of assessment (preliminary/final): 40/60

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 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. Life science students will focus on understanding and correct application of these methods on real data.

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: 88

A	B	C	D	E	FX
28,41	18,18	25,0	20,45	4,55	3,41

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD., Mgr. Vladimír Boža, PhD.
Last change: 08.02.2018
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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: 22

A	B	C	D	E	FX
31,82	18,18	22,73	9,09	9,09	9,09

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 23.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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: 8

A	B	C	D	E	FX
62,5	25,0	12,5	0,0	0,0	0,0

Lecturers: Mgr. Marek Šuppa

Last change: 23.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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, written and oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

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 to artificial neural networks (NS), NS logical neurons. The digital / analog Perceptron: the concept of learning with a teacher pattern recognition.
Linear NS: vector spaces, autoassociative memory. Multi-layer perceptron: the method of back propagation error, training and test set, generalization, selection of model validation. Hebbovské learning without a teacher, feature extraction, principal component analysis. Learning the competition, self-organizing map clustering, topographic display. Hybrid NS: radial-basis-function NS algorithm for training, properties. Recurrent NS: temporal structure in data, models and algorithms for training, echo state networks, recurrent self-organizing maps. Hopfield model: deterministic and stochastic dynamics, attractors in state space, autoassociative memory. Deep architecture 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.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 84

A	B	C	D	E	FX
26,19	14,29	16,67	10,71	11,9	20,24

Lecturers: prof. Ing. Igor Farkaš, Dr.

Last change: 10.02.2019

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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)

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

Learning outcomes:

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).
A. Fillová, A.Valková : Numerická matematika II ,UK Bratislava 1991 (skriptá).
S. Míka: Numerické metody algebry, SNTL Praha 1982.
P. Přikryl: Numerické metody matematické analýzy, SNTL Praha 1985.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 324

A	B	C	D	E	FX
26,85	21,3	19,75	12,04	17,9	2,16

Lecturers: Mgr. Jela Babušíková, PhD., Dr. Hana Mizerová

Last change: 02.06.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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: 398					
A	B	C	D	E	FX
32,91	14,82	18,84	13,07	14,82	5,53
Lecturers: doc. RNDr. Robert Lukoťka, PhD.					
Last change: 04.10.2016					
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.					

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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-646/00

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

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.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

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:

Notes:

Past grade distribution
Total number of evaluated students: 1433

A	B	C	D	E	FX
99,16	0,56	0,0	0,0	0,0	0,28

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

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

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:

Notes:

Past grade distribution
Total number of evaluated students: 1331

A	B	C	D	E	FX
99,77	0,08	0,0	0,08	0,0	0,08

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. Ondrej Podkonický, Mgr. Júlia Raábová, PhD.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

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:

Notes:

Past grade distribution
Total number of evaluated students: 1081

A	B	C	D	E	FX
99,44	0,37	0,0	0,0	0,0	0,19

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

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:

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:

Notes:

Past grade distribution
Total number of evaluated students: 957

A	B	C	D	E	FX
99,37	0,42	0,0	0,0	0,1	0,1

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

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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 / independent work
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation: assignments, homeworks, written exams, computer animation project or programming project from physically based animation of natural phenomena
Exam: final exam, project presentation, oral exam
Evaluation scale: A 92%, B 84%, C 76%, D 68%, E 60%
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:
english

Notes:

Past grade distribution
Total number of evaluated students: 225

A	B	C	D	E	FX
44,89	19,11	10,22	8,44	6,67	10,67

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 42
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

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: 33

A	B	C	D	E	FX
51,52	21,21	9,09	3,03	6,06	9,09

Lecturers: Ing. Róbert Lipovský

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Test and written 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:
An Introduction to Probability Theory and its Applications : Vol. 1 / Wiliam Feller. Bodmin : Cornwell university, 1950
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: 14

A	B	C	D	E	FX
92,86	0,0	0,0	0,0	7,14	0,0

Lecturers: doc. RNDr. Eduard Toman, CSc.

Last change: 28.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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: 82

A	B	C	D	E	FX
30,49	9,76	19,51	17,07	19,51	3,66

Lecturers: Mgr. Lenka Filová, PhD., Mgr. Lívia Leššová

Last change: 13.05.2018
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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:
Short test at each tutorial, practical programming exam
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:
Programming paradigms (object oriented, functional, declarative and others). Language constructs and concepts (pattern matching, continuations, closures, lazy evaluation, futures, promises and others). Examples in various programming languages.

Recommended literature:
Haskell the craft of functional programming / Simon Thompson. Harlow : Pearson, 1999
Common Lisp : the language / Guy L. Steele, Jr. ; with contributions by Scott E. Fahlman ... [et al.] and with contributions to the 2nd ed. by Daniel G. Bobrow ... [et al.]. Bedford : Digital Press, 1990
Concepts, Techniques, and Models of Computer Programming / Peter Van Roy, Seif Haridi. MIT Press (March 1, 2004)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 54

A	B	C	D	E	FX
44,44	11,11	20,37	12,96	9,26	1,85

Lecturers: RNDr. Richard Ostertág, PhD., Mgr. Šimon Sádovský
Last change: 21.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

STATE EXAM DESCRIPTION

University: Comenius University in 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 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: prof. RNDr. Rastislav Kráľovič, PhD.	

COURSE DESCRIPTION

University: Comenius University in 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:** 42 / 14
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): 40/60

Learning outcomes:
Graduates of the course will be familiar with the issues of parallel and distributed programming. At the beginning they learn the means of writing parallel and distributed programs as necessary logic to evidence and formulate their properties. Later they learn the solution of selected problems in parallel and distributed programming (eg. The shortest path problem Reader-Writers, Večerajúci philosophers, coordination meetings, drinkers philosophers, sorting, Faulty channels, Global snapshots, detected a stable qualities, Byzantine Agreement).

Class syllabus:
Initially, the students met a simple language for writing parallel programs and dostribuovaných. UNITY (syntax and semantics) Fundamental parallel and distributed architectures as a way for them to map UNITY programs. The list is the logic of allowing express safetty and progress vlastnostio programs and formally prove the correctness of programs. Subsequently they learn the solution of selected problems in parallel and distributed programming (eg. The shortest way, reader-writers problem dinning philosophers, coordination meetings, drinkers philosophers, sorting, Faulty channels, Global snapshots, detected a stable qualities, Byzantine Agreement). Their zones can optionally be spread in závoslosti the development in this area.

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: 161

A	B	C	D	E	FX
20,5	11,18	23,6	31,06	8,7	4,97

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 13.01.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

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: 27

A	B	C	D	E	FX
44,44	22,22	14,81	11,11	7,41	0,0

Lecturers: doc. RNDr. Martin Plesch, PhD.

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

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

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

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: 8

A	B	C	D	E	FX
50,0	12,5	0,0	12,5	12,5	12,5

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 14.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester:

Educational level: II.

Prerequisites:

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

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

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: 8

A	B	C	D	E	FX
50,0	12,5	0,0	12,5	12,5	12,5

Lecturers: doc. RNDr. Dana Pardubská, CSc.

Last change: 14.10.2015
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The subject provides a course in Russian language for beginners.

Recommended literature:
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 654

A	B	C	D	E	FX
60,4	15,9	10,09	4,74	1,83	7,03

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The subject continues the program of Russian language (1) and provides a course of Russian for beginners.

Recommended literature:
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 399

A	B	C	D	E	FX
65,66	15,79	9,02	4,01	1,0	4,51

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
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:
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 196

A	B	C	D	E	FX
70,41	17,35	8,67	2,55	0,0	1,02

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
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:
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 138

A	B	C	D	E	FX
75,36	13,04	7,25	2,9	0,72	0,72

Lecturers: PhDr. Elena Klátiková

Last change: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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:

Learning outcomes:

Class syllabus:

Recommended literature:

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

Last change: 13.05.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Homewrok assignments, presentaion, class activity, written exam
Scale of assessment (preliminary/final): 40/60

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, dynamic trees. Data structures for text data (inverted index, tries, sufix trees and arrays), lowest common ancestor, succint data structures, Fibonacci heaps, structures for integer keys, 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: 76

A	B	C	D	E	FX
26,32	17,11	10,53	18,42	23,68	3,95

Lecturers: Mgr. Jakub Kováč, PhD., doc. Mgr. Bronislava Brejová, PhD.

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:

Learning outcomes:

Class syllabus:

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: 23.01.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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: 29

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

Lecturers: prof. RNDr. Branislav Rovan, PhD.

Last change: 14.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 44

A	B	C	D	E	FX
50,0	11,36	20,45	0,0	0,0	18,18

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

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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:

Learning outcomes:

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:

Notes:

Past grade distribution
Total number of evaluated students: 31

A	B	C	D	E	FX
70,97	16,13	3,23	3,23	0,0	6,45

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

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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:

Learning outcomes:

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
75,0	12,5	12,5	0,0	0,0	0,0

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

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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:

Learning outcomes:

Class syllabus:
Presentations and discussions about current publications in bioinformatics.

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
83,33	0,0	16,67	0,0	0,0	0,0

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

Last change: 04.10.2016

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 50/50

Learning outcomes:

Class syllabus:

Recommended literature:

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: 02.06.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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: 56					
A	B	C	D	E	FX
16,07	1,79	7,14	8,93	33,93	32,14
Lecturers: doc. RNDr. Damas Gruska, PhD., Ing. Ján Komara, PhD., Mgr. Ján Kľuka, PhD.					
Last change: 22.09.2017					
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.					

COURSE DESCRIPTION

University: Comenius University in 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:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 30

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

Lecturers: Mgr. Branislav Nedbálek

Last change:

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 9

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

Lecturers: Mgr. Branislav Nedbálek

Last change:

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAI/2-AIN-285/17	**Course title:** Symbolic Programming and LISP
Educational activities: **Type of activities:** course **Number of hours:** **per week:** 3 **per level/semester:** 42 **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: 23.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

STATE EXAM DESCRIPTION

University: Comenius University in 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/2-INF-175/15 - 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: prof. RNDr. Rastislav Kráľovič, PhD.	

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 45

A	B	C	D	E	FX
57,78	11,11	22,22	6,67	0,0	2,22

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28
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: 27

A	B	C	D	E	FX
81,48	14,81	0,0	3,7	0,0	0,0

Lecturers: doc. RNDr. Daniel Olejár, PhD.

Last change: 14.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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 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: 136

A	B	C	D	E	FX
42,65	20,59	12,5	7,35	5,15	11,76

Lecturers: prof. RNDr. Branislav Rovan, PhD.

Last change: 14.10.2015

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

STATE EXAM DESCRIPTION

University: Comenius University in 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.	
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: prof. RNDr. Rastislav Kráľovič, PhD.	

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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)
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
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
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: 100

A	B	C	D	E	FX
15,0	31,0	31,0	14,0	9,0	0,0

Lecturers: RNDr. Jaroslav Janáček, PhD.

Last change: 09.02.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
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): 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. Formal power series and their combinatorial meaning. Weighted automata and their use for digital image compression. Eigenvalues and eigenvectors, their applications. The Perron-Frobenius theory of nonnegative matrices. Calculus of finite differences. Solution methods for recurrences and recurrence systems of selected types. Spectral graph theory and its applications in computer science. Complete partially ordered sets (CPOs), lattices, and their applications. Formal concept analysis. Basics of universal algebra. A relation of finite automata to monoids, varieties of formal languages.

Recommended literature:
Electronic materials on the course website.
Grafy a jejich aplikace / Jiří Demel. Praha : 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
Nonnegative Matrices / Henryk Minc. New York : Wiley, 1988
An Introduction to Difference Equations / Saber Elaydi. New York : Springer, 2005
Graph Spectra for Complex Networks / Piet Van Mieghem. Cambridge : Cambridge University Press, 2011
An Introduction to the Theory of Graph Spectra / Dragoš Cvetković, Peter Rowlinson, Slobodan Simić. Cambridge : Cambridge University Press, 2010

Introduction to Lattices and Order / B. A. Davey, H. A. Priestley. Cambridge : Cambridge University Press, 2002
Universal Algebra / P. M. Cohn. Dordrecht : D. Reidel Publishing Company, 1981
Elements of Automata Theory / Jacques Sakarovitch. Cambridge : Cambridge University Press, 2009
Automata, Languages, and Machines, vol. B / Samuel Eilenberg. New York : Academic Press, 1976
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: 4

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: 26.06.2018

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 56
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Course requirements:
homework assignments, written and oral exam
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will gain basic familiarity with some more advanced branches of mathematics in connection to their modern applications (not only) in computer science.

Class syllabus:
Metric spaces, Banach fixed point theorem and its applications. Fundamentals of point-set and algebraic topology, topological methods in combinatorics and computer science. Basic notions of category theory. Coalgebra.

Recommended literature:
Electronic materials on the course website.
Introduction to Topology and Modern Analysis / George F. Simmons. New York : McGraw-Hill, 1963
Topology / Klaus Jänich. New York : Springer, 1984
Using the Borsuk-Ulam Theorem / Jiří Matoušek. Heidelberg : Springer, 2003
Basic Category Theory / Tom Leinster. Cambridge : Cambridge University Press, 2014
Introduction to Coalgebra / Bart Jacobs. Cambridge : Cambridge University Press, 2017

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: 26.06.2018
Approved by: prof. RNDr. Rastislav Kráľovič, PhD.

COURSE DESCRIPTION

University: Comenius University in 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:** 28 / 28
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: 163

A	B	C	D	E	FX
29,45	15,34	21,47	19,63	10,43	3,68

Lecturers: Mgr. Martin Krupa, Mgr. Robert Mráz, Mgr. Ing. Matúš Tuna

Last change: 22.09.2017

Approved by: prof. RNDr. Rastislav Kráľovič, PhD.