Study plan

Name of study plan: Matematická informatika

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Mathematical Informatics Type of study: Follow-up master full-time

Required credits: 0

Elective courses credits: 120 Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 0

The role of the block: P

Code of the group: NMSPMINF1

Name of the group: MDP P_MINFN 1st year

Requirement credits in the group:

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

Credits in the group: 0 Note on the group:

Note on the grou	φ					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
01DIZO	Digital Image Processing Barbara Zitová Barbara Zitová Barbara Zitová (Gar.)	ZK	4	2P+2C		Р
01JAU	Languages, Automata and Computability Petr Ambrož Petr Ambrož Petr Ambrož (Gar.)	Z,ZK	4	3P+1C		Р
01MAL	Mathematical Logic Petr Cintula Petr Cintula (Gar.)	Z,ZK	4	2+1		Р
01NEUR1	Neural Networks and their Applications 1 Martin Hole a, František Hakl František Hakl František Hakl (Gar.)	ZK	2	2+0		Р
1800P	Object Oriented Programming Miroslav Virius Miroslav Virius (Gar.)	Z	2	2C	Z	Р
01PAA	Parallel Algorithms and Architectures Tomáš Oberhuber Tomáš Oberhuber (Gar.)	KZ	4	2P+1C	L	Р
01TEC	Number Theory Zuzana Masáková, Edita Pelantová Zuzana Masáková Zuzana Masáková (Gar.)	ZK	5	4P+0C		Р
01TG	Graph Theory Petr Ambrož, Jan Volec Petr Ambrož Petr Ambrož (Gar.)	ZK	5	4P+0C		Р
01TIN	Information Theory Tomáš Hobza Tomáš Hobza (Gar.)	ZK	2	2+0	Z	Р
01TEMA	Matrix Theory Edita Pelantová Edita Pelantová (Gar.)	Z	3	2+0	L	Р
01TSLO	Complexity Theory Petr Ambrož, Jan Volec Petr Ambrož Jan Volec (Gar.)	ZK	3	3+0	Z	Р
01VUSI1	Research Project 1 Edita Pelantová, estmír Burdík estmír Burdík Edita Pelantová (Gar.)	Z	6	0+6	Z	Р
01VUSI2	Research Project 2 Edita Pelantová, estmír Burdík estmír Burdík Edita Pelantová (Gar.)	KZ	8	0P+8C	L	Р

Characteristics of the courses of this group of Study Plan: Code=NMSPMINF1 Name=MDP P_MINFN 1st year

01DIZO | Digital Image Processing | ZK | 4 | Image sampling and quantization, Shannon theorem, aliasing basic image operations, histogram, contrast stretching, noise removal, image sharpening linear filtering in the spatial and frequency domains, convolution, Fourier transform edge detection, corner detection feature detection image degradations and their modelling, inverse and Wiener filtering, restoration of motion-blurred and out-of-focus blurred images image segmentation mathematical morphology image registration and matching

01JAU	Languages, Automata and Computability	Z.ZK	4
	regular languages and operations, star lemmas. (3 lectures) 2. Kleene theorem (2 lectures) 3. Determinisation a minimisation	,	xt-free grammas
and their reductions	(2 lectures) 5. Pushdown automata and context-free languages (2 lectures) 6. Star lemma for CFL, closure properties of CFL	(2 lectures) 7. Turin	g machine,
recursive and recurs	sively enumerable languages, methods of design of turing machines (2 lectures) 8. Undecidability (1 lecture) 9. Rice theorem,	Post correspondence	e problem,
undecidable propert	ties of CFL (2 lectures)		
01MAL	Mathematical Logic	Z,ZK	4
Logic is in the same	e time an object studied by mathematics and the language used to formalize and study mathematics. The goal of the course is	to introduce basic n	otion of results
of classical mathem	atical logic. 1.Propositions, evaluation, tautologies, axioms, theorems, soundness, completeness, and decidability of Hilbert an	nd Gentzen style prop	ositional calculi.
2.Language of pred	icate calculus, terms, formulas, relational structures, satisfiability, truth, tautologies, axioms, theorems, soundness, model con-	structions. 3.Gödel o	ompleteness
theorem, Skolem an	nd Herbrand theorems. 4.The first and the second Gödel theorems on incompleteness of Peano arithmetics and undecidability	y of predicate calculu	IS.
01NEUR1	Neural Networks and their Applications 1	ZK	2
Keywords: Neural no	etworks, data separation, functional approximation, supervised learning	'	
1800P	Object Oriented Programming	Z	2
This course consists	s of the contributions of students concerning given topics concerned on technologies uded in program development.	1	
01PAA	Parallel Algorithms and Architectures	KZ	4
This course deals w	rith the parallel data processing. It is important in situations when one processing unit (CPU) is not powerful enough to finish g	given task in reasona	ble time. When
designing parallel al	lgorithms, good knowledge of the parallel architectures is important. Therefore these architectures are studied as a part of this	s course too.	
0.4.T.E.O.		1	
011EC	Number Theory	l ZK	5
	Number Theory nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha	ZK antic equations, Pell'	_
1. Algebraic and trai			_
Algebraic and trainings of integers in	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions		_
Algebraic and trainings of integers in 01TG	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha	antic equations, Pell'	s equation 5.
Algebraic and trainings of integers in 01TG Basic notion of grainings.	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory	antic equations, Pell' ZK atrix-Tree Theorem).	s equation 5. 5 6. Euler tours
Rings of integers in 01TG 1. Basic notion of grand Hamilton cycles	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory aph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Ma	antic equations, Pell' ZK atrix-Tree Theorem).	s equation 5. 5 6. Euler tours
Algebraic and trankings of integers in 01TG Basic notion of grand Hamilton cycles graphs. 12. Spectrur	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory aph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Mass. 7. Maximal and perfect matching. 8. Edge coloring. 9. Flows in networks. 10. Vertex coloring. 11. Plannar graphs (Kuratowski	antic equations, Pell' ZK atrix-Tree Theorem).	s equation 5. 5 6. Euler tours
Algebraic and trankings of integers in 01TG Basic notion of grand Hamilton cycles graphs. 12. Spectrum 01TIN	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory aph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Mass. 7. Maximal and perfect matching. 8. Edge coloring. 9. Flows in networks. 10. Vertex coloring. 11. Plannar graphs (Kuratowski m of the adjacency matrix. 13. Extremal graph theory.	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co	s equation 5. 5 6. Euler tours loring of planar
Algebraic and trankings of integers in O1TG Basic notion of grand Hamilton cycles graphs. 12. Spectrum O1TIN Information theory each.	nscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory raph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Mass. 7. Maximal and perfect matching. 8. Edge coloring. 9. Flows in networks. 10. Vertex coloring. 11. Plannar graphs (Kuratowski m of the adjacency matrix. 13. Extremal graph theory. Information Theory	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co	s equation 5. 5 6. Euler tours loring of planar 2 n) entropy, the
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory.	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co	s equation 5. 5 6. Euler tours loring of planar 2 n) entropy, the
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory e source coding theory and pattern recognitions.	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co	s equation 5. 5 6. Euler tours loring of planar 2 n) entropy, the
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory and pattern recognit O1TEMA O1TEMA	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (informationsion, signal procession, signal procession.	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls,
Algebraic and trankings of integers in O1TG Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory and pattern recognition O1TEMA	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (informationsion, signal procession, signal procession.	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls,
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrum O1TIN Information theory esource coding theory and pattern recognition O1TEMA The subject deals me semidefinite matrices.	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (informationsion, signal procession, signal procession.	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls,
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrui O1TIN Information theory esource coding theorand pattern recognition O1TEMA The subject deals mesemidefinite matrices O1TSLO	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the cation in	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory and pattern recognition o1TEMA The subject deals me semidefinite matrice O1TSLO The course is devoted.	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the cation in	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive 3 f deterministic of
1. Algebraic and trankings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theorand pattern recognition O1TEMA The subject deals me semidefinite matrice O1TSLO The course is devotion ondeterministic Turing O1TS in the course is devotion ondeterministic Turing O1TS in the course is devotion.	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the cation in	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive 3 f deterministic of
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory and pattern recognition O1TEMA The subject deals material semidefinite matrices O1TSLO The course is devoted the course is devot	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory Th	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the cation in	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive 3 f deterministic of
1. Algebraic and trankings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theorand pattern recognit O1TEMA The subject deals me semidefinite matrice O1TSLO The course is devot nondeterministic Turclasses. Class of int O1VUSI1	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory aph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Mass. 7. Maximal and perfect matching. 8. Edge coloring. 9. Flows in networks. 10. Vertex coloring. 11. Plannar graphs (Kuratowski m of the adjacency matrix. 13. Extremal graph theory. Information Theory Explores the fundamental limits of the representation and transmission of information. We will focus on the definition and implication, and the channel coding theorem. These concepts provide a vital background for researchers in the areas of data compression. Matrix Theory Matrix Theory Matrix Theory Explores the fundamental limits of matrices and canonical forms of matrices 2) Perron-Frobenius theory and its applications 3) tensor pass Complexity Theory ed to incorporation of complexity questions during algorithm development, introduction to NP completeness and generally to complex bounded by time or space. Emphasis is placed on mutual relations among these classes. Aside from nondetermiceractive protocols is presented at the end of lecture course.	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the procession). Z product 4) Hermitian ZK complexity classes of inistic classes we example in the procession.	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive 3 f deterministic of amine probability
1. Algebraic and train Rings of integers in O1TG 1. Basic notion of grand Hamilton cycles graphs. 12. Spectrul O1TIN Information theory esource coding theory and pattern recognit O1TEMA The subject deals me semidefinite matrice O1TSLO The course is devot nondeterministic Turclasses. Class of int O1VUSI1	Inscendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diopha algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic expansions Graph Theory aph theory. 2. Edge and vertex connectivity (Menger Theorem). 3. Bipartite graphs. 4. Trees and forests. 5. Spanning trees (Mas. 7. Maximal and perfect matching. 8. Edge coloring. 9. Flows in networks. 10. Vertex coloring. 11. Plannar graphs (Kuratowski m of the adjacency matrix. 13. Extremal graph theory. Information Theory Explores the fundamental limits of the representation and transmission of information. We will focus on the definition and implication, and the channel coding theorem. These concepts provide a vital background for researchers in the areas of data compression. Matrix Theory Matrix Theory Matrix Theory Explores the fundamental limits of matrices and canonical forms of matrices 2) Perron-Frobenius theory and its applications 3) tensor pass Complexity Theory ed to incorporation of complexity questions during algorithm development, introduction to NP completeness and generally to complex bounded by time or space. Emphasis is placed on mutual relations among these classes. Aside from nondetermiceractive protocols is presented at the end of lecture course. Research Project 1	antic equations, Pell' ZK atrix-Tree Theorem). i theorem), vertex co ZK cations of (information in the procession). Z product 4) Hermitian ZK complexity classes of inistic classes we example in the procession.	5 6. Euler tours loring of planar 2 n) entropy, the sing, controls, 3 and positive 3 f deterministic of amine probability

Code of the group: NMSPMINF2

Name of the group: MDP P_MINFN 2nd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 6 courses

Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
01DPSI1	Master Thesis 1 estmír Burdík estmír Burdík (Gar.)	Z	10	0+10	Z	Р
01DPSI2	Master Thesis 2 estmír Burdík estmír Burdík (Gar.)	Z	20	0+20	L	Р
01KOAL	Commutative Algebra Severin Pošta Severin Pošta (Gar.)	ZK	3	1P+1C		Р
01DISE	Diploma Seminar estmír Burdík estmír Burdík (Gar.)	Z	1	0P+2S		Р
01SU1	Machine Learning 1 Jan Flusser Jan Flusser (Gar.)	ZK	3	2P+1C		Р
01NEUR2	Theoretical Fundamentals of Neural Networks Martin Hole a Martin Hole a (Gar.)	ZK	3	2+0		Р

Characteristics of the courses of this group of Study Plan: Code=NMSPMINF2 Name=MDP P_MINFN 2nd year

01DPSI1	Master Thesis 1	Z	10
Master's thesis prepara	tion.		
01DPSI2	Master Thesis 2	Z	20
Master's thesis prepara	tion.		

01KOAL	Commutative Algebra	ZK	3
1. Rings, ideals, homon	orphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Poly	nomials with ratio	nal coefficients,
factorization of polynom	ials. 5. Hilbert's Nullstellensatz, ideals and manifolds, Krull dimension. 6. Fields, extensions, finite fields. 7. Introduction to Ga	lois theory, Galois	extensions,
group and corresponde	nce.		
01DISE	Diploma Seminar	Z	1
In the first part of the se	minar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal	requirements for o	diploma projects
at the faculty. The secor	nd part is designed as a practical training for the defence of the diploma project. The students give oral presentations of the co	urrent state of the	research results
achieved during the wo	k on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of impro	ving the student's	performance.
01SU1	Machine Learning 1	ZK	3
[1] features for description	n and recognition of 2-D shapes [2] invariant features, Fourier descriptors, moment invariants, differential invariants [3] statisti	cal pattern recogni	ition, supervised
and nonsupervised class	sification, NN- classifier, linear classifier, Bayessian classifier [4] clustering in a feature space, iterative and hierarchical meth	ods [5] dimension	ality reduction
of a feature space			
01NEUR2	Theoretical Fundamentals of Neural Networks	ZK	3
Kaunyarda, Funational a	proximation, supervised learning, Vapnik-Chervonenkis-dimension	, '	

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

The role of the block: V

Code of the group: NMSPMINFV

Name of the group: MDP P_MINFN Optional courses

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

Credits in the group: 0 Note on the group:

	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their					
Code	members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
01ALTI	Algebraic structures in theoretical informatics Edita Pelantová, Severin Pošta, Milena Svobodová Severin Pošta Severin Pošta (Gar.)	ZK	3	1+1		V
01ZASIG	Analysis and Processing of Diagnostic Signals Zden k P evorovský Zden k P evorovský (Gar.)	ZK	3	3+0		V
18DDS	Database System Decomposition Dana Majerová, Jaromír Kukal Dana Majerová Jaromír Kukal (Gar.)	ZK	4	2P+2C	L	V
01FIMA	Financial and Insurance Mathematics Joel Horowitz Joel Horowitz (Gar.)	ZK	2	2P+0C	Z	V
01KOS	Compressed Sensing Jan Vybíral Jan Vybíral (Gar.)	ZK	2	2+0	Z	V
01MMNS	Mathematical Modelling of Non-linear Systems Michal Beneš Michal Beneš Michal Beneš (Gar.)	ZK	3	1P+1C	Z	V
18MEMC	Monte Carlo Method Miroslav Virius, František Gašpar Miroslav Virius Miroslav Virius (Gar.)	Z,ZK	4	2P+2C	Z	V
01MRMMI	Methods for Sparse Matrices Ji í Mikyška Ji í Mikyška Ji í Mikyška (Gar.)	KZ	2	2P+0C		V
01SMF	Modern Trends in Corporate Information Technologies Tomáš Oberhuber Tomáš Oberhuber (Gar.)	Z	2	2	L	V
01NELO	Nonlinear Optimization Radek Fu ik Radek Fu ik Radek Fu ik (Gar.)	ZK	4	3P+0C		V
01PALG	Advanced Algorithmization Tomáš Oberhuber Tomáš Oberhuber (Gar.)	KZ	2	1P+1C		٧
01PNL	Advanced Methods of Numerical Linear Algebra Ji í Mikyška Ji í Mikyška Ji í Mikyška (Gar.)	ZK	2	2P+0C		٧
01PMU	Probabilistic Learning Models František Hakl František Hakl (Gar.)	ZK	2	2+0	Z	V
01PSM1	Problem Seminar in Mathematical Analysis Mat j Tušek Mat j Tušek (Gar.)	Z	2	0P+2S	Z	٧
01PSM2	Problem Seminar in Mathematical Analysis 2 Mat j Tušek Mat j Tušek (Gar.)	Z	2	28		V
01PAMF	Mainframe Programming in Assembler Tomáš Oberhuber Tomáš Oberhuber (Gar.)	Z	2	2	L	٧
01SFTO	Special Functions and Transformations in Image Analysis Jan Flusser Jan Flusser (Gar.)	ZK	2	2+0	L	V
01SUP	Start-up Project P emysl Rubeš P emysl Rubeš (Gar.)	KZ	2	2P+0C		V
01SMS1	Student's seminar in mathematics 1 Václav Klika Václav Klika (Gar.)	Z	2	0P+2C		V
01SMS2	Student's seminar in mathematics 2 Václav Klika Václav Klika (Gar.)	Z	2	0P+2C	L	V

01TEH	Game Theory Jan Volec Jan Volec Jan Volec (Gar.)	ZK	2	2+0	L	V
01UMF	Introduction to Mainframe Tomáš Oberhuber Tomáš Oberhuber (Gar.)	Z	2	1P+1C	Z	V
01UTS	Introduction to the Theory of Semigroups Václav Klika Václav Klika Václav Klika (Gar.)	ZK	3	2P+0C		V
01ZPB2	Introduction to Computer Security 2 Petr Voká Petr Voká Petr Voká (Gar.)	Z	2	1+1		V
haracteristics of	the courses of this group of Study Plan: Code=NMSPMINFV Na	ame=MDP P M	NFN Op	tional cou	rses	·
D1ALTI	Algebraic structures in theoretical informatics		.		'K	3
	to the applications of some special algebraic structures. The first part of the course is de				•	
	of algebraic equations and other applications. The second part of the course is devoted to ons of numbers utilized in fast effective algorithms for arithmetic operations and evaluation		_	ic number field	ls, used to	constructions
01ZASIG	Analysis and Processing of Diagnostic Signals	ons of elementary ful	ictions.	7	'K	3
	g, signal transformations and filtrations, spectral and time-frequency analysis				-10	3
18DDS	Database System Decomposition			Z	'K	4
The lectures are oriente	ed to basic terms, database objects, their properties and relationships together with the acc	cent to logics of deco	mposition a	and application	s of datab	ase operations
01FIMA	Financial and Insurance Mathematics			Z	K	2
	luction to the problems of life and non-life insurance and financial mathematics.			1 7	71/	
01KOS The lecture will introduce	Compressed Sensing ce basic concepts of the theory of compressed sensing – an area founded in 2006 in the	works of D. Donoho	F Cande	ı	K	2 studies the
	ons of underdetermined systems of linear equations. Due to the applications of sparse re					
was quickly used in ma	ny different fields. After the first survey lecture, we will study the mathematical foundation	ns of the theory. We	prove gene	eral NP-comple	eteness of	the search for
	tems of linear equations. We introduce conditions which ensure also existence of more e					•
	ices. As an effective solution method, we will analyze I1-minimization and Orthogonal Mat he corruption of measurements and the optimality of the results.	ching Pursuit. We wi	ll also study	stability and ro	obustness	of the obtaine
01MMNS	Mathematical Modelling of Non-linear Systems			7	'K	3
-	basic terms and results of the theory of finite- and infinitedimensional dynamical system	s generated by evol	utionary dif	I		-
bifurcations and chaos.	Second part is devoted to the explanation of basic results of the fractal geometry dealing	ng with attractors of s	uch dynam	nical systems.		
18MEMC	Monte Carlo Method			Ζ,	ZK	4
	to the numerical method Monte Carlo and to its selected applications.					
01MRMMI	Methods for Sparse Matrices	vahvoja agustiana Th		1	(Z	2
	utilization of sparse matrices in direct methods for solution of large systems of linear alg definite matrices. Theoretic results will be further applied for solution of more general sy				ecompositi	-
-	delinite manifest. Theoretic recalls will be further applied for column of more general by		s of the me	thods and com	mon imple	ementation
issues will be covered.		votorno. Mani loataro	s of the me	thods and com	nmon imple	ementation
	Modern Trends in Corporate Information Technologies	- Como. Main Touturo	s of the me		nmon imple	ementation 2
	to mainframe administration basics. After introduction to mainframe hardware the following				Z	2
01SMF The course is devoted t non-relational database	to mainframe administration basics. After introduction to mainframe hardware the followings in the mainframe environment.			saction system	Z ns, virtuali	2 zation and
01SMF The course is devoted t non-relational database 01NELO	to mainframe administration basics. After introduction to mainframe hardware the followings in the mainframe environment. Nonlinear Optimization	ng lectures covers s	ecurity, tran	saction system	Z ns, virtuali:	2 zation and
01SMF The course is devoted t non-relational database 01NELO Nonlinear optimization p	to mainframe administration basics. After introduction to mainframe hardware the followings in the mainframe environment. Nonlinear Optimization problems find their application in may areas of applied mathematics. The lecture covers the	ng lectures covers so	ecurity, tran	saction system	Z ns, virtuali:	2 zation and
01SMF The course is devoted to non-relational database 01NELO Nonlinear optimization poptimization and basic relations.	to mainframe administration basics. After introduction to mainframe hardware the followings in the mainframe environment. Nonlinear Optimization Problems find their application in may areas of applied mathematics. The lecture covers the methods for unconstrained and constrained optimization. The lecture is supplemented by	ng lectures covers so	ecurity, tran	saction system Z amming theory	Z ns, virtuali: 'K with emph	2 zation and 4 nasis on conve
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01UMF	Introduction to Mainframe	Z	2
In this course we teach	the mainframe architecture. We explain how to operate the system z/OS, how to start a job using the JCL and we explain sor	ne differences wh	en programming
in C/C++ for z/OS:			
01UTS	Introduction to the Theory of Semigroups	ZK	3
It is known that a syster	n of linear ordinary differential equations can be solved by virtue of the matrix exponential. However, the extension to partial	differential equation	ons is not
straightforward. For exa	mple in the case of heat equation the matrix is replaced by Laplace operator which is not bounded and the series for the expor	ential will not con	verge. Moreover,
solutions of the heat eq	uation exist in general only for positive times and hence the solution operator can be at best a semigroup. The aim of the cou	rse is to provide a	a mathematical
foundation for these typ	es of problems and extend the concept of stability from ordinary differential equations, which is again in relation to spectrum	of a linear operate	or.
01ZPB2	Introduction to Computer Security 2	Z	2

List of courses of this pass:

Code	Name of the course	Completion	Credits
01ALTI	Algebraic structures in theoretical informatics	ZK	3
The course is devo	oted to the applications of some special algebraic structures. The first part of the course is devoted to the Gröbner bases of ideals of p	olynomial rings ar	nd their use
for solving of syste	ems of algebraic equations and other applications. The second part of the course is devoted to the ring of integers of algebraic number	r fields, used to co	nstructions
	of various representations of numbers utilized in fast effective algorithms for arithmetic operations and evaluations of elementary fu	ınctions.	
01DISE	Diploma Seminar	Z	1
In the first part of th	he seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requ	uirements for diplo	ma projects
at the faculty. The s	second part is designed as a practical training for the defence of the diploma project. The students give oral presentations of the curren	nt state of the rese	arch results
achieved during th	the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving	g the student's per	rformance.
01DIZO	Digital Image Processing	ZK	4
	nd quantization, Shannon theorem, aliasing basic image operations, histogram, contrast stretching, noise removal, image sharpening lir	I	spatial and
	s, convolution, Fourier transform edge detection, corner detection feature detection image degradations and their modelling, inverse ar	_	-
. ,	of motion-blurred and out-of-focus blurred images image segmentation mathematical morphology image registration and match	hing	
01DPSI1	Master Thesis 1	Z	10
0.5. 0	Master's thesis preparation.	- 1	
01DPSI2	Master Thesis 2	Z	20
0101 312	Master's thesis preparation.	۱ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ	20
0451848		71/	
01FIMA	Financial and Insurance Mathematics	ZK	2
	This course is an introduction to the problems of life and non-life insurance and financial mathematics.		
01JAU	Languages, Automata and Computability	Z,ZK	4
	, regular languages and operations, star lemmas. (3 lectures) 2. Kleene theorem (2 lectures) 3. Determinisation a minimisation (2 lectu	*	ū
	tions (2 lectures) 5. Pushdown automata and context-free languages (2 lectures) 6. Star lemma for CFL, closure properties of CFL (2 le		
	ecursively enumerable languages, methods of design of turing machines (2 lectures) 8. Undecidability (1 lecture) 9. Rice theorem, Post	t correspondence	problem,
recursive and re			
recursive and re	undecidable properties of CFL (2 lectures)		
recursive and re		ZK	3
01KOAL	undecidable properties of CFL (2 lectures)		
01KOAL 1. Rings, ideals, ho	undecidable properties of CFL (2 lectures) Commutative Algebra	nials with rational o	coefficients,
01KOAL 1. Rings, ideals, ho	undecidable properties of CFL (2 lectures) Commutative Algebra omomorphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Polynomials	nials with rational o	coefficients,
01KOAL 1. Rings, ideals, ho	undecidable properties of CFL (2 lectures) Commutative Algebra commorphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Polynomials, 5. Hilbert's Nullstellensatz, ideals and manifolds, Krull dimension. 6. Fields, extensions, finite fields. 7. Introduction to Galoi	nials with rational o	coefficients,
01KOAL 1. Rings, ideals, ho factorization of po	undecidable properties of CFL (2 lectures) Commutative Algebra commonorphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Polynomials. 5. Hilbert's Nullstellensatz, ideals and manifolds, Krull dimension. 6. Fields, extensions, finite fields. 7. Introduction to Galoi group and correspondence.	nials with rational of the state of the stat	coefficients, ktensions,
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01KOAL 1. Rings, ideals, ho factorization of po 01KOS The lecture will in search for sparse s	undecidable properties of CFL (2 lectures) Commutative Algebra commonorphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Polynomials. 5. Hilbert's Nullstellensatz, ideals and manifolds, Krull dimension. 6. Fields, extensions, finite fields. 7. Introduction to Galoi group and correspondence. Compressed Sensing Introduce basic concepts of the theory of compressed sensing – an area founded in 2006 in the works of D. Donoho, E. Candes, and T.	nials with rational of is theory, Galois expenses and the state of the	coefficients, ktensions, 2 tudies the , this theory
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01KOAL 1. Rings, ideals, ho factorization of po 01KOS The lecture will in search for sparse swas quickly used in sparse solutions	undecidable properties of CFL (2 lectures) Commutative Algebra commonorphisms, prime and maximal ideals. 2. Rings of polynomials, symmetric polynomials, irreducibility. 3. Gröbner bases. 4. Polynomials. 5. Hilbert's Nullstellensatz, ideals and manifolds, Krull dimension. 6. Fields, extensions, finite fields. 7. Introduction to Galoi group and correspondence. Compressed Sensing Introduce basic concepts of the theory of compressed sensing – an area founded in 2006 in the works of D. Donoho, E. Candes, and T. solutions of underdetermined systems of linear equations. Due to the applications of sparse representations in electric engeneering and in many different fields. After the first survey lecture, we will study the mathematical foundations of the theory. We prove general NP-co	rials with rational of is theory, Galois expenses and the state of the	2 tudies the , this theory e search for
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01PAA			
This source deals	Parallel Algorithms and Architectures	KZ	4
	with the parallel data processing. It is important in situations when one processing unit (CPU) is not powerful enough to finish given t		time. When
design	ing parallel algorithms, good knowledge of the parallel architectures is important. Therefore these architectures are studied as a part	of this course too.	
01PALG	Advanced Algorithmization	KZ	2
Keywo	rds: String algorithms, graph algorithms, dynamic programming, suffix tress, graph cuts, numerical methods for solution of partial diffe	erential equations.	
01PAMF	Mainframe Programming in Assembler	Z	2
In this course the b	nasics of programming in z/OS are explained namely the programming in assembler. Basic instructions, macros, I/O operations, DLL I	library loading and	some other
	topics are discussed.	, ,	
01PMU	Probabilistic Learning Models	ZK	2
	he theory PAC learning model, VC-dimension of finite sets, Sauer, Cover and Radon's lemma, VC-dimension of composed mappings.	I	l
	necessary patterns, analysis of properties of delta rule based learning processes, PAC learning model extensions and PAO learning,		
lor lower bound or i	Boolean functions.	Tourier coemicient	3 Search for
0.4 DNII		71/	
01PNL	Advanced Methods of Numerical Linear Algebra	ZK	2
'	real numbers in computers, behaviour of rounding errors during numerical computations, sensitivity of a problem, numerical stability o	_	-
	genvalues of a given matrix and sensitivity of roots of systems of linear algebraic equations. Then, the backward analysis of these pro-		
second part of the	course is devoted to the methods of QR-decomposition, least squares problem, and to several modern Krylov subspace methods for the	he solution of syste	ms of linear
	algebraic equations and the Lanczos method for approximation of the eigenvalues of a symmetric square matrix.		
01PSM1	Problem Seminar in Mathematical Analysis	Z	2
This course is a ser	minar in advanced mathematical analysis and its applications. Seminar talks will be delivered by students, department staff, and invite	ed quests. There ar	re no exams
but stud	dents will be assigned by some homework and they will give at least one talk per semester. The seminar is held in English and attenda	ance is mandatory	
01PSM2	Problem Seminar in Mathematical Analysis 2	Z	2
	minar in advanced mathematical analysis and its applications. Seminar talks will be delivered by students, department staff, and invite	। ed guests. There ar	re no exams
	dents will be assigned by some homework and they will give at least one talk per semester. The seminar is held in English and attend		
01SFTO		ZK	2
!	Special Functions and Transformations in Image Analysis lens topics of the courses ROZ1 and ROZ2. Main attention will be paid to several special functions and transformations (especially m	I	l
ransiorm) and thei	ir use in selected tasks of image processing - edge detection, noise removal, recognition of deformed objects, image registration, image registrat	age compression, e	etc. Both the
	theory and practical applications will be discussed.		_
01SMF	Modern Trends in Corporate Information Technologies	Z	2
The course is de	evoted to mainframe administration basics. After introduction to mainframe hardware the following lectures covers security, transactior	n systems, virtualiz	ation and
	non-relational databases in the mainframe environment.		
01SMS1	Student's seminar in mathematics 1	Z	2
01SMS2	Student's seminar in mathematics 2	Z	2
01SU1	Machine Learning 1	ZK	3
l	pription and recognition of 2-D shapes [2] invariant features, Fourier descriptors, moment invariants, differential invariants [3] statistical prices.	I	_
	d classification, NN- classifier, linear classifier, Bayessian classifier [4] clustering in a feature space, iterative and hierarchical method	_	-
and nonsupervise	of a feature space, iterative and meracinical method	is [3] uimensionaiit	y reduction
040110	·	1/7	0
01SUP	Start-up Project	KZ	',
			2
01TEC	Number Theory	ZK	5
	Number Theory transcendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diophantic	ZK	5
		ZK equations, Pell's e	5
	transcendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diophantic	ZK equations, Pell's e	5
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Algebraic and to the second seco	transcendental numbers 2. Algebraic number fields, field isomorphisms 3. Rational approximations, continued fractions 4. Diophantic Rings of integers in algebraic number fields and divisibility 6. Number representation in non-integer bases, finite and periodic exp. Game Theory	ZK equations, Pell's e ansions ZK Theorem, Strategy	5 quation 5. 2 stealing. 4.
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01ZASIG	Analysis and Processing of Diagnostic Signals	ZK	3
· ·	Digital signal processing, signal transformations and filtrations, spectral and time-frequency analysis	•	,
01ZPB2	Introduction to Computer Security 2	Z	2
18DDS	Database System Decomposition	ZK	4
The lectures are ori	ented to basic terms, database objects, their properties and relationships together with the accent to logics of decomposition and applic	ations of database	operations.
18MEMC	Monte Carlo Method	Z,ZK	4
·	This courseis devoted to the numerical method Monte Carlo and to its selected applications.	'	
1800P	Object Oriented Programming	Z	2
	This course consists of the contributions of students concerning given topics concerned on technologies uded in program development of the contributions of students concerning given topics concerned on technologies uded in program development.	pment.	

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