Study plan

Name of study plan: Matematické inženýrství

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Applications of Natural Sciences Type of study: Follow-up master full-time Required credits: 79 Elective courses credits: 41 Sum of credits in the plan: 120 Note on the plan:

Name of the block: Compulsory courses of the specialization Minimal number of credits of the block: 79 The role of the block: PO

Code of the group: NMSMIPP1 Name of the group: NMSMI - povinné p edm ty 1. ro ník Requirement credits in the group: In this group you have to gain at least 39 credits Requirement courses in the group: In this group you have to complete at least 10 courses Credits in the group: 39 Note on the group:

Note on the grou	μ.					
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
01ASY	Asymptotical Methods Ji í Mikyška Ji í Mikyška Ji í Mikyška (Gar.)	Z,ZK	3	2+1	Z	PO
01FA3	Functional Analysis 3	Z,ZK	3	2+1	Z	PO
01MKP	Finite Element Method Michal Beneš Michal Beneš (Gar.)	ZK	3	1P+1C	L	PO
01PNLA	Advanced Methods of Numerical Linear Algebra <i>Ji í Mikyška</i>	ZK	3	2+0	Z	PO
01TEMA	Matrix Theory Edita Pelantová Edita Pelantová Edita Pelantová (Gar.)	Z	3	2+0	L	PO
01NAH	Theory of Random Processes Jan Vybíral Jan Vybíral Jan Vybíral (Gar.)	ZK	3	3+0	z	PO
01VAM	Variational Methods Michal Beneš Michal Beneš (Gar.)	ZK	3	1P+1C	Z	PO
01VUMM1	Research Project 1 estmír Burdík estmír Burdík (Gar.)	Z	6	0+6	Z	PO
01VUMM2	Research Project 2 estmír Burdík estmír Burdík (Gar.)	KZ	8	0+8	L	PO
01ZTG	Introduction to Graph Theory Petr Ambrož	ZK	4	4+0		PO

Characteristics of the courses of this group of Study Plan: Code=NMSMIPP1 Name=NMSMI - povinné p edm ty 1. ro ník

01ASY	Asymptotical Methods	Z,ZK	3		
Examples. Addition parts of mathematical analysis (generalized Lebesgue integral, parametric integrals.) Asymptotic relations a expansions - properties; algebraical and analytical					
operations. Applied asy	mptotics of sequences and sums; integrals of Laplace and Fourier type.				
01FA3	Functional Analysis 3	Z,ZK	3		
Advanced parts of funct	ional analysis needed for modern quantum theory.		·		
01MKP	Finite Element Method	ZK	3		
The course is devoted to	o the mathematical theory of the finite element method numerically solving boundary-value and initial-boundary-value problem	ns for partial differ	ential equations.		
Mathematical properties	s of the method are explained. The approximation error estimates are derived.				
01PNLA	Advanced Methods of Numerical Linear Algebra	ZK	3		
Representation of real numbers in computers, behaviour of rounding errors during numerical computations, sensitivity of a problem, numerical stability of an algorithm. We will analyse					
sensitivity of the eigenvalues of a given matrix and sensitivity of roots of systems of linear algebraic equations. Then, the backward analysis of these problems will be performed. The					
second part of the cours	second part of the course is devoted to the methods of QR-decomposition, least squares problem, and to several modern Krylov subspace methods for the solution of systems of linear				
algebraic equations and the Lanczos method for approximation of the eigenvalues of a symmetric square matrix.					

01TEMA	Matrix Theory	Z	3	
The subject deals mainly with: 1) similarity of matrices and canonical forms of matrices 2) Perron-Frobenius theory and its applications 3) tensor product 4) Hermitian and positiv				
semidefinite matrices				
01NAH	Theory of Random Processes	ZK	3	
The course is devoted ir	part to the basic notions of the general theory of random processes and partially to the theory of stationary processes and se	quences both we	akly and strongly	
stationary ones.				
01VAM	Variational Methods	ZK	3	
The course is devoted to the methods of classical variational calculus - functional extrema by Euler equations, second functional derivative, convexity or monotonicity. Further, it conta				
investigation of quadrat	ic functional, generalized solution, Sobolev spaces and variational problem for elliptic PDE's.			
01VUMM1	Research Project 1	Z	6	
Research project on the selected topic under the supervision. Supervision and regular checking of the research project under preparation.				
01VUMM2	Research Project 2	KZ	8	
Research project on the	e selected topic under the supervision. Supervision and regular checking of the research project under preparation.		•	
01ZTG	Introduction to Graph Theory	ZK	4	
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Code of the group: NMSMIPP2

Name of the group: NMSMI - povinné p edm ty 2. ro ník

Requirement credits in the group: In this group you have to gain at least 40 credits Requirement courses in the group: In this group you have to complete at least 5 courses Credits in the group: 40

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
01DPMM1	Master Thesis 1 estmír Burdík estmír Burdík estmír Burdík (Gar.)	Z	10	0+10	Z	PO
01DPMM2	Master Thesis 2 estmír Burdík estmír Burdík estmír Burdík (Gar.)	Z	20	0+20	L	PO
01MMNS	Mathematical Modelling of Non-linear Systems Michal Beneš Michal Beneš (Gar.)	ZK	3	1P+1C	Z	PO
01NELI	Nonlinear Programming	ZK	4	3P+0C	Z	PO
01DSEMI	Diploma Seminar estmír Burdík estmír Burdík estmír Burdík (Gar.)	Z	3	0+2		PO

Characteristics of the courses of this group of Study Plan: Code=NMSMIPP2 Name=NMSMI - povinné p edm ty 2. ro ník

01DPMM1 Master Thesis 1	Z	10		
Master's thesis preparation.				
01DPMM2 Master Thesis 2	Z	20		
Master's thesis preparation.				
01MMNS Mathematical Modelling of Non-linear Systems	ZK	3		
The course consists of basic terms and results of the theory of finite- and infinitedimensional dynamical systems generated by evolutionary different	ial equations, and	description of		
bifurcations and chaos. Second part is devoted to the explanation of basic results of the fractal geometry dealing with attractors of such dynamical s	ystems.			
01NELI Nonlinear Programming	ZK	4		
Nonlinear optimization problems find their application in may areas of applied mathematics. The lecture covers the basics of mathematical programmir	ng theory with emp	phasis on convex		
optimization and basic methods for unconstrained and constrained optimization. The lecture is supplemented by illustrative examples.				
01DSEMI Diploma Seminar	Z	3		
Preparation of the thesis defense.				

Name of the block: Elective courses Minimal number of credits of the block: 0 The role of the block: V

Code of the group: NMSMIVP Name of the group: NMSMI - volitelné p edm ty Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
01ZASIG	Analysis and Processing of Diagnostic Signals Zden k P evorovský Zden k P evorovský Zden k P evorovský (Gar.)	ZK	3	3+0		V

01MADR	Calculus Revisited	Z	2	0+2	L	V
01APST1	Aperiodic Structures 1	Z	2	2+0		V
01APST2	Aperiodic Structures 2	Z	2	2+0		V
01ASM	Application of Statistical Methods Tomáš Hobza Tomáš Hobza (Gar.)	KZ	2	2+0		V
18DATS	Database System Decomposition	KZ	4	2+2	L	V
01DPV	Differential Calculus on Manifolds Mat j Tušek Mat j Tušek Mat j Tušek (Gar.)	ZK	2	2+0	L	V
12DRP	Differential Equations on Computer Richard Liska Richard Liska Richard Liska (Gar.)	Z,ZK	5	2+2	Z	V
01DYRO	Dynamic Decision Making Ta jana Gaj	ZK	4	3+1		V
01DRO1	Dynamic Decision Making 1 Ta jana Gaj	ZK	2	2+0		V
01DRO2	Dynamic Decision Making 2 Miroslav Kárný, Ta jana Gaj Miroslav Kárný Miroslav Kárný (Gar.)	ZK	2	2+0		V
01FIMA	Financial and Insurance Mathematics Joel Horowitz Joel Horowitz (Gar.)	ZK	2	2P+0C	Z	V
02SPEC	Geometrical Aspects of Spectral Theory	ZK	2	2+0	L	V
01KF	Quantum Physics	Z,ZK	6	4+2	L	V
02LIAG	Lie Algebras and Lie Groups	Z,ZK	6	3+2	L	V
01LOM	Logic for Mathematicians Petr Cintula	ZK	2	2+0		V
01MLO	Logic for Mathematicians Petr Cintula	ZK	2	2+0		V
01MAL	Mathematical Logic Petr Cintula Petr Cintula Petr Cintula (Gar.)	Z,ZK	4	2+1		V
01MMDT1	Mathematical Methods in Fluid Dynamics 1	Z	2	2+0	Z	V
01MMDT2	Mathematical Methods in Fluid Dynamics	ZK	2	2+0	L	V
01MBI	Mathematical Methods in Biology and Medicine Václav Klika Václav Klika Václav Klika (Gar.)	KZ	3	2+1	Z	V
01MKO	Method of Finite Volumes Michal Beneš	KZ	2	1+1	Z	V
18MMC	Monte Carlo Method	Z	4	2+2	Z	V
01MRM	Methods for Sparse Matrices <i>Ji í Mikyška</i>	ZK	2	2+0	L	V
01PDR	Modern Theory of Partial Differential Equations Mat j Tušek	ZK	2	2+0		V
01NSAP	Neural Computers and Their Applications Martin Hole a	ZK	4	3+0	Z	V
01NEUR1	Neural Networks and their Applications 1 Martin Hole a, František Hakl František Hakl František Hakl (Gar.)	ZK	2	2+0		V
01NSPP	Numerical Simulations of Convection Problems	KZ	2	1+1	L	V
01NUSO	Numerical Software	Z	3	2+0	Z	V
1800P	Object Oriented Programming Miroslav Virius Miroslav Virius Miroslav Virius (Gar.)	Z	2	2C	Z	V
01PAA	Parallel Algorithms and Architectures Tomáš Oberhuber Tomáš Oberhuber Tomáš Oberhuber (Gar.)	KZ	4	2P+1C	L	V
01PALG	Advanced Algorithmization Tomáš Oberhuber Tomáš Oberhuber Tomáš Oberhuber (Gar.)	KZ	2	1P+1C		V
01PMU	Probabilistic Learning Models František Hakl František Hakl (Gar.)	ZK	2	2+0	Z	V
01UMIN	Probabilistic Models of Artificial Intelligence Ji ina Vejnarová Ji ina Vejnarová Ji ina Vejnarová (Gar.)	KZ	2	2+0	Z	V
01REAN	Regression Data Analysis Tomáš Hobza	Z,ZK	4	2+2		V
01REGA	Regression Data Analysis	ZK	2	2+0	Z	V
01SFTO	Special Functions and Transformations in Image Analysis Jan Flusser Jan Flusser Jan Flusser (Gar.)	ZK	2	2+0	L	V
01STOM	Stochastic Methods	KZ	2	2+0		V
01STOS	Stochastic Systems	ZK	2	2+0	Z	V
01SVK	Student's Scientific Conference Ji í Mikyška Ji í Mikyška (Gar.)	Z	1	5 dní		V
01NEUR2	Theoretical Fundamentals of Neural Networks Martin Hole a Martin Hole a Martin Hole a (Gar.)	ZK	3	2+0		V
01TC	Number Theory	ZK	4	2+0	L	V
01TIN	Information Theory Tomáš Hobza Tomáš Hobza (Gar.)	ZK	2	2+0	Z	V

OTTSLO Complexity Theory At Wood, Sen Androx Per Mathor J. On Volce (Gar.) ZK 3 34-0 Z 01UKRY Introduction to Cryptology Z 2 2-0-0 L 01ZPB1 Introduction to Cryptology Z 2 1-1-1 01ZPB2 Introduction to Cryptology Z 2 1+1-1 01RP21 Introduction to Cryptology Z 2 1+1-1 01RP21 Introduction to Cryptology Z 2 1+1-1 01RO21 Image Processing and Pattern Recognition 1 ZK 4 2+2-2 L 01RO21 Image Processing and Pattern Recognition 2 ZK 4 2+1 2 01RASIG Diagnostic Signal Processing and Prosesing 0 Signal signal processing and Processing 0 ZK 3 3+0 L 01RASIG Calculus Provisorsky Calculus Provisorsky ZK 3 3+0 L 01RASIG Calculus Provisorsky Calculus Provisorsky ZK 3 3+0 L 01RASIG Calculus Provisorsky
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DIROZP2 Image Processing and Pattern Recognition 2 ZK 4 2+1 DISIG Diagnostic Signal Processing Zden & Pevorvsky ZK 3 3+0 L Characteristics of the courses of this group of Study Plan: Code=NMSMIVP Name=NMSMI - voliteline p edm ty ZK 3 3+0 L Characteristics of the courses of this group of Study Plan: Code=NMSMIVP Name=NMSMI - voliteline p edm ty ZK 3 3+0 L Characteristics of the courses of this group of Study Plan: Code=NMSMIVP Name=NMSMI - voliteline p edm ty ZK 2 Characteristics of the course of this group of Study Plan: Code=NMSMIVP Name=NMSMI - voliteline p edm ty ZK Digital signal group consain, group transformations, spectral and time-frequency analysis ZK Digital signal processing and the term instead character of generality of the term; statistical aspect? descriptional inclusions and the regits of coline inclusions and the regits of coline inclusions and the regits of a spectra the regit has a lower serie of the spectra coline inclusions approach flaces to edministration of a serie inclusion of the course of the spectra coline inclusions and the regits of a spectra the spectra coline inclusion of a serie inclusion of a serie inclusion of a serie inclusion of the spectra coline inclusion of the course coline inclusion of the course coline inclusion inclusion of the course colin the serie works, on etand
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Characteristics of the courses of this group of Study Plan: Code=NMSMIVP Name=NMSMI - volitelné p dem ty Cla2ASIG Analysis and Processing of Diagnostic Signals ZK Digital signal processing, signal transformations and fittrations, spectral and time-frequency analysis Z OHMODE Calculus Revisited Z The term function - development of the term, misleading character of generality of the term; a statistical aspect; discontinuous functional in the passages Produents of definition of an envine incomplexity of definition of the mitting: usage of titler or all improves theory character of definition of a methods by communication of a surface area of common to the finite usage of titler or all improves theory character of definition of a method surger - tables and theory interval methods by: Caustry's approach, Remarko approach; proteines tead Labesgue is andefinition of a method by: Caustry's approach, Remarko approach; proteines tead Labesgue is ander theory. Interval methods to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar other to complexity is abutan of open problems in the field. OTAPST1 Appriodic Structures 1 Z The seminar is dovided to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar other bacts toring mescathris: divident of statistical and analysis to concente problems in the field. OTAPST1 Appriodic Structures 2 Z The seminar is dovided to combinatorise on infinite words, non-standard numeration systems and aperiodic tiling.
Characteristics of the courses of this group of Study Plan: Code=NNISMIVP Name=NMISMI - voliteline p edity ZK Digital signal processing, signal transformations and fittations, spectral and time-frequency analysis ZK OttaASIG Calcolute Revisited Z The term function - development of the term, misleading character of generality of the term, is statistical aspect: discommuos functions are still coses to continuous on the length of curve-classical aspectational paperoach, cetermination of surface series continuous functional in curve space Integral turbes of the length of curve-classical aspectation; determination of surface series of cosmission of choice, comparison of R to finding an universal methodogy: Cauchy's spronach, pressing problems tead Ledesgue to adefinition of an envirosity, the two fundame troughts, Labesgue's negative states of cosmission. Z The seminar is deviced to combinatoris on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar of the hosts foreign reservers: in terget and thinding the searcher. Z The seminar is deviced to combinatoris on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar of the hosts foreign reservers. Z The seminar is deviced to combinatoris on infinite words, non-standard numeration systems and aperiodic tiling. KZ The seminar is deviced to combinatoris on infinite words, non-standard numeration systems and aperiodic tiling. KZ The seminar is a continuation of OtAPST1. Is dottatis
U12ASIG Inhallysis and processing, signal transformations and transformation and the term, astatistical aspect; discontinuous functions are still close to continuous or - supremum, Imsup, lim have the same scheme, definition of term filter; usage of filter for all time passages. Problem if definition of the term, reliaded curve, Lebsegués approach, (leads to necessity of definition of surface area of composition closely). Calcy's approach, Reisman's approach, presiden problems into the equation of holice; comparison of Ri term in the admited to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar of ten hosts foreign researchers. Sudents participate actively in solution of open problems in the field. O1APST1 Aperiodic Structures 2 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar of the hosts foreign researcher. Students participate actively in solution of open problems in the field. X O1APST2 Aperiodic Structures 2 Z The course focuses on applications of statistical data analysis to concrete problems in the field. XZ O1APST1 Applications of statistical data analysis to concrete problems in the field. ZX The course focuses on appl
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Districts Districts Districts Districts Districts - supremum, limsup, lim have the same scheme, definition of term fitter, usage of fitter for all limit passages Problem of definition of the length of curve - classical approxiems, item ourse in analysis, the necessity of definition of new integraf - Lebes the supremum, limsup, limit have the same scheme, definition of term fitter, uses gate of fitter for all limit passages Problem of of environmental of surface area of com for finding an universal methodology, Caudry's approach, resensiting approach, persiting problems is lead to locessity of definition of new integraf the two funding the universal methodology, Caudry's approach, resensiting approach, persiting problems is lead to besque to a definition of a new integraf the use funding the universal methodology, Caudry's approach, resensiting approach, persiting app
The seminar is a continuous of a second statistical Market and consultation of period statistical second sta
- supremum, imsup, im have the same scheme; definition of term itter; usage of titler for all imm passages Problem to definition of the length of curve - classical approxem; curve in analysis; the necessity of definition of new integral - Lebes functional approach; curve same semi-continuous functional in curve space Integral theory - historical introversion of a new integral; the two fundame throughts; Lebesgue's measure and measurability; existence (and construction) of unmeasurable set (in Lebesgue esnes) and the axiom of choice; comparison of Ri Lebesgue's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory; new perspectives in integral theory - DIAPST1 Aperiodic Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign researcher. Students participate actively in solution of open problems in the field. DIAPST2 Aperiodic Structures 2
problems; term curve in analysis; the necessity of defining new terms; rectifiable curve; Lebesgue's approach (leads necessity of definition of new integral - Lebes truncional approach: curve length as a lower sent-continuous functional in curve space integral terms; historical introduction, determination of surve integrals and methodology. Caudry's approach, Remann's approach, persisting problems lead Lebesgue sense) and the axiom of chine; comparison of Ris Lebesgue's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory; new perspectives in integral theory OIAPSTI Aperiodic Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign researches: Students participate actively in solution of open problems in the field. OIAPSTI Apprication of Statistical Methods The seminar is a continuation of 01APST1. It is devoted to advanced issues of combinatorics on infinite words, non-standard numeration systems and aperiodic tiling the seminar often hosts foreign researcher: Students participate actively in solution of open problems in the field. OIASM Application of Statistical Methods The course focuses on applications of selected methods of statistical data analysis to concrete problems including their solutions using statistical software. Namely they hypotheses tests about parameters of normal distribution, nonparametric methods, contingency tables, linear regression and correlation, analysis of variance. 18DATS Database System Decomposition 1 ketcurs are subout parameters of normal distribution, nonparametric methods, contingency tables, linear dispersion, consense, order abality, convergence, modified equations, analysis of ochernetial equations, numerical solution, shallow water equations, future equations, future equations, future equations, future equations, future as a parabolic and eliptic equations, solid elipsensin consensation in ama
Initial approach: curve length as a lower semi-continuous functional in curve space Integral theory - historical introduction; determination of surface area of comp thoughts; Lebesgue's measure and measure bitly; existence (and construction) of unmeasurable set (in Lebesgue sense) and the axiom of choice; comparison of R Lebesgue's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory; new perspectives in integral theory OIAPSTI Aperiodic Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign respectives in the field. Z OIAPSTI Aperiodic Structures 2 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration of open problems in the field. KZ OIAPSTI Aperiodic Structures 2 Z The seminar is devoted to orbinatorics on infinite words, non-standard numeration of specificat methods of statistical devoted to advanced issues of combinatorics on infinite words, non-standard numeration systems and aperiodic tiling the solutions using statistical software. Namely the solutions of selected methods of statistical data analysis to concrete problems including their solutions using statistical software. IBDATS Database System Decomposition KZ The lectures are oriented to basic terms, database objects, their properties and relationships together with the accent to logics of decomposition and applications of attractions, analysical methods, ordinary differential equations, sub-properties and
for finding an universal methodology: Cauchy's approach, Riemann's approach, persisting problems lead Lebesgue sense) and the axiom of choice; comparison of Ri Lebesgue's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory; new perspectives in integral theory OTAPST1 Aperiodic Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign reserve theory in solution of open problems in the field. Z OTAPST2 Aperiodic Structures 2 Z The seminar is a continuation of 01APST1. It is devoted to advanced issues of combinatorics on infinite words, non-standard numeration systems and aperiodic tiling. KZ The seminar often hosts toreign researcher. Students participate actively in solution of open problems including their solutions using KZZ KZ The seminar often hosts toreign researcher. Students participate actively in solution of open problems including their solutions using statistical software. Namely typothesas tests about parameters of normal distribution, nonparametric methods, contingency tables, linear regression and correlation, analysis of variance. 18DATS Database System Decomposition KZ Torus Z Ordinary differential equations, analysis to concrete problems including the solution suggest with measure the state of chooses on application of Statistical MHTM. Z The lectures are oriente
thoughts; Lebesgue's measure and measurability; existence (and construction) of unmeasurable set (in Lebesgue sense) and the axiom of choice; comparison of Ri Lebesgue's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory, new perspectives in integral theory [OIAPST] Aperiodic Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign new participate actively in solution of open problems in the field. OIAPST2 Aperiodic Structures 2 Z The seminar is a continuation of 01APST1. It is devoted to advanced issues of combinatorics on infinite words, non-standard numeration systems and aperiodic tiling the seminar often hosts foreign researcher. Students participate actively in solution of open problems in the field. OIASM Application of Statistical Methods The sourse focuses on applications of Statistical Methods The locurse focuses on applications of Statistical Methods. Contingency tables, linear regression and correlation, analysis of variance. INDATS Database System Decomposition KZ Stokes theorem. KZ Stokes theorem. KZ Cordnary differential Calculus on Manifolds Stokes theorem. Z Cordnary differential equations, analytical methods, office of the solution, finite differential equations, analytical methods, runmerical solution, finite difference schemes, order stability, convergence, modified equation, dispersion: Conservation laws and their numerical solution, finite difference and ediplic equations, analytical methods; or systems) that behave appropriately in various circumstances are highly demanded (artificial intelligent equations, analytical methods; Partial differential equations, mumerical solution, finite difference and method application resources. Effective decision mating regurs with worked about: the agent analysis of schemes. Differential equations, dispersion; Conservation laws and their numerical solution, finite difference ac
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Lebesgues integral and inding the essence of difference, weak spots of Lebesgue's integral, the essence of measure theory; new perspectives in untegral theory OIAPSTI Appendicit Structures 1 Z The seminar is devoted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often hosts foreign resc participate actively in solution of open problems in the field. Image: Comparison of Comparison Comparison of Comparison Comparison on Computer Z 12DRP Differential Equations on Computer Z Ordinary differential comparison, diffusion, dispersion, Conservation laws and their numerical solution, shallow water equations, stability, Partial differential equations, and periodic Comparison, Conservation laws and their numerical solution, shallow water equations, Euler equations, Lagrangia and topical comparison, Conservation laws and their numerical solution, shallow water equations, Lagrangia and topical comparison, Conservation laws and their numerical solution, shallow atter equations, and equations, diffusion, dispersion, Conservation laws and therin numerical solution, shallow demanded (artificial Intelligue)
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This course is an introduction to the problems of life and non-life insurance and financial mathematics.
028EFC Competing Apparts of Spectral Theory
U25PEC Geometrical Aspects of Spectral Theory ZK
Spectral theory is an extremely rich field which has found its application in many areas of physics and mathematics. One of the reason which makes it so attractive of
is that it provides a unifying framework for problems in various branches of mathematics, for example partial differential equations, calculus of variations, geometry, st
etc. The goal of the lecture is to acquaint the students with spectral methods in the theory of linear differential operators coming both from modern as well as classic
special amphasis put on geometrically induced spectral properties. We give an overview of both classical results and recent developments in the field, and we wish t
special emphasis put on geometrically induced spectral properties. We give an overview of both classical results and recent developments in the field, and we wish to
special emphasis put on geometrically induced spectral properties. We give an overview of both classical results and recent developments in the field, and we wish t providing a physical interpretation of the mathematical theorems.
special emphasis put on geometrically induced spectral properties. We give an overview of both classical results and recent developments in the field, and we wish to providing a physical interpretation of the mathematical theorems. 01KF Quantum Physics Z,ZK

02LIAG	Lie Algebras and Lie Groups	Z.ZK	6
Definitions and properti	es of Lie groups and Lie algebras. Different types of Lie algebras, root systems and classification of complex simple Lie algebras.	pras. Introduction	to theory of
representations.			
01LOM	Logic for Mathematicians	ZK	2
01MLO	Logic for Mathematicians	ZK	2
01MAL	Mathematical Logic	Z,ZK	4
Logic is in the same tim	e 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 mathematic	al logic. 1. Propositions, evaluation, tautologies, axioms, theorems, soundness, completeness, and decidability of Hilbert and C	Gentzen style prop	ositional calculi.
2.Language of predicate	e calculus, terms, formulas, relational structures, satisfiability, truth, tautologies, axioms, theorems, soundness, model constru	uctions. 3.Gödel o	ompleteness
theorem, Skolem and H	erbrand theorems. 4.The first and the second Gödel theorems on incompleteness of Peano arithmetics and undecidability of	predicate calculu	IS.
01MMDT1	Mathematical Methods in Fluid Dynamics 1	Z	2
The contents of the cou	rse is the introduction to mathematical methods in fluid dynamice. Concretely: mathematical modelling of fundamentals phys	ical laws by mear	is of partial
differential equations, fo	rmulation of associated boundary or initial-boundary value problems for various type sof fluids as well as various type sof flo	ws, properties an	d some special
	ems. Marthanna dia al Marthanda in Etwid Dumannian	71/	0
UTIMINID I Z	Mathematical Methods in Fluid Dynamics	ZK	Z
simplified problems as y	o mainematical rundamentals of huid mechanics models, classical and advanced limite difference and limite volume technique values multi-dimensional problems of inviscid and viscous flow	es applied to num	encal solution of
	Mathematical Matheda in Dialogy and Madiaina	K 2	2
Spatially independent m	I Wall lefitation were servitable system; reaction-diffusion equations; travelling waves; nattern formation; conditions for Turi	na instability the	S effect of domain
size: the concept of stat	vility in PDEs spectrum of a linear operator semigroups	ing instability, the	
	Method of Finite Volumes	K7	2
The subject is devoted t	the numerical solutions of linear partial differential equations of first and second order using the finite difference and the fin	ite volume metho	ds The lecture
discusses the basic pro	perties of numerical methods for solving elliptic, parabolic and hyperbolic equations, the modified equation and the numerical	I viscosity.	
18MMC	Monte Carlo Method	7	4
This courseis devoted to	the numerical method Monte Carlo and to its selected applications.	-	·
01MRM	Methods for Sparse Matrices	ZK	2
The course is aimed at	utilization of sparse matrices in direct methods for solution of large systems of linear algebraic equations. The course will cov	er the decomposi	tion theory for
symmetric and positive	definite matrices. Theoretic results will be further applied for solution of more general systems. Main features of the methods	and common imp	lementation
issues will be covered.			
01PDR	Modern Theory of Partial Differential Equations	ZK	2
Sobolev spaces, continu	Jous and compact embedding theorems, trace theorem. Elliptic PDE of Second Order, Lax-Milgram theorem, regularity, maxing	num principle, har	monic functions.
01NSAP	Neural Computers and Their Applications	ZK	4
Introduction into the the	ory of artificial neural networks, some important kinds of neural networks, threshold vectors analysis of binary nets, neural neuronal networks, threshold vectors analysis of binary nets, neural neuronal networks, threshold vectors analysis of binary nets, neural networks, threshold vectors analysis of binary networks, threshold vectors analysis of bina	etworks evaluation	n of Boolean
functions, neural networ	ks from the point of view of function approximation, neural networks from the point of view of probability theory, numerical pr	operties of learnin	ng algorithms.
01NEUR1	Neural Networks and their Applications 1	ZK	2
r Revwords, Neural netwo			
	Numerical Simulations of Conversion Drablema	V7	2
01NSPP Students will be acquain	Numerical Simulations of Convection Problems red with the 2D and 3D numerical simulations of flow problems described by potential inviscid and viscous flow. It is a trans	KZ	2 wing profile in
01NSPP Students will be acquain a 2D and 3D lattice in 2	Numerical Simulations of Convection Problems ned with the 2D and 3D numerical simulations of flow problems described by potential, inviscid and viscous flow. It is a trans D and 3D channels of different shape in the boundary layer, and in the modeling of cardiovascular problems. Some cases of	KZ onic flow around a	2 a wing profile, in mulations are
01NSPP Students will be acquain a 2D and 3D lattice, in 2 also mentioned.	Numerical Simulations of Convection Problems need with the 2D and 3D numerical simulations of flow problems described by potential, inviscid and viscous flow. It is a trans 2D and 3D channels of different shape, in the boundary layer, and in the modeling of cardiovascular problems. Some cases o	KZ onic flow around a f turbulent flow sin	2 a wing profile, in mulations are
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01NSPP Students will be acquair a 2D and 3D lattice, in 2 also mentioned. 01NUSO The course deals with t	Numerical Software Numerical Software Numerical Software he implementation of several numerical methods in existing software libraries. The attention will be paid to libraries for solution	KZ onic flow around a if turbulent flow sin Z n of problems of l	2 a wing profile, in mulations are 3 inear algebra
01NSPP Students will be acquair a 2D and 3D lattice, in 2 also mentioned. 01NUSO The course deals with th with full and sparse mat	Numerical Software he implementation of several numerical methods in existing software libraries. The attention will be paid to libraries for solution rices, and to the solution of ODE and PDE	KZ onic flow around a f turbulent flow sin Z n of problems of l	2 a wing profile, in mulations are 3 inear algebra
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01NSPP Students will be acquair a 2D and 3D lattice, in 2 also mentioned. 01NUSO The course deals with t with full and sparse mat 18OOP This course consists of	Numerical Simulations of Convection Problems need with the 2D and 3D numerical simulations of flow problems described by potential, inviscid and viscous flow. It is a trans 2D and 3D channels of different shape, in the boundary layer, and in the modeling of cardiovascular problems. Some cases of Numerical Software he implementation of several numerical methods in existing software libraries. The attention will be paid to libraries for solution rices, and to the solution of ODE and PDE Object Oriented Programming the contributions of students concerning given topics concerned on technologies uded in program development.	KZ onic flow around a f turbulent flow sin Z n of problems of l Z	2 a wing profile, in mulations are 3 inear algebra 2
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01SVK	Student's Scientific Conference	Z	1
This is the active partici	pation of the student in one of the approved student conferences. The list of such conferences is defined by the course guara	ntor.	
01NEUR2	Theoretical Fundamentals of Neural Networks	ZK	3
Keywords: Functional a	pproximation, supervised learning, Vapnik-Chervonenkis-dimension		
01TC	Number Theory	ZK	4
The subject is devoted	to number theory with focus on continued fractions and fundamentals of algebraic number theory.		
01TIN	Information Theory	ZK	2
Information theory explo	ores the fundamental limits of the representation and transmission of information. We will focus on the definition and implication	ons of (informatio	n) entropy, the
source coding theorem,	and the channel coding theorem. These concepts provide a vital background for researchers in the areas of data compression	on, signal proces	sing, controls,
and pattern recognition			
01TSLO	Complexity Theory	ZK	3
The course is devoted t	o incorporation of complexity questions during algorithm development, introduction to NP completeness and generally to com	plexity classes of	f deterministic or
nondeterministic Turing	machines bounded by time or space. Emphasis is placed on mutual relations among these classes. Aside from nondeterminist	ic classes we exa	amine probability
classes. Class of interact	ctive protocols is presented at the end of lecture course.		
01UKRY	Introduction to Cryptology	Z	2
An introductive survey of	of cryptography and cryptoanalysis starting with classical ciphers, passing through mechanical rotor machines, symmetric and	d asymmetric cry	ptography to
quantum cryptography.			
01ZPB1	Introduction to Computer Security 1	Z	2
01ZPB2	Introduction to Computer Security 2	Z	2
01TRLA	Basic of Representation Theory of Lie Algebras	ZK	2
Lie algebra is an integra	al part of many theories in natural sciences. The lecture formulates the fundamentals of Lie algebras and their representations	S.	
01ROZ1	Image Processing and Pattern Recognition 1	ZK	4
An introductory course of	n image processing and pattern recognition. Major attention is paid to image sampling and quantization, image preprocessing	noise removal, co	ntrast stretching,
sharpening, and de-blu	rring, Wiener filtering, blind deconvolution), edge detection, morphology and geometric transformations and warping. Numero	us applications a	nd experimental
results are presented in	addition to the theory.		
01ROZP2	Image Processing and Pattern Recognition 2	ZK	4
The course is a continu	ation of ROZ1. Major attention is paid to features for shape description and recognition, and to general pattern recognition te	hniques. Numero	ous applications
and experimental result	s are presented in addition to the theory.		
01ZSIG	Diagnostic Signal Processing	ZK	3
The course is devoted t	o modern techniques of the analog and digital signal processing used in physics, measurements and information science. Ba	sic signal transfo	rms and their
discrete equivalents are	explained to describe signals and their transfer in different representations. Practical training is based on MATLAB software w	ith Signal and Wa	avelet Toolboxes.
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List of courses of this pass:

Code	Name of the course	Completion	Credits	
01APST1	Aperiodic Structures 1	Z	2	
The seminar is dev	oted to combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space. The seminar often host	s foreign researche	er. Students	
	participate actively in solution of open problems in the field.			
01APST2	Aperiodic Structures 2	Z	2	
The seminar is a continuation of 01APST1. It is devoted to advanced issues of combinatorics on infinite words, non-standard numeration systems and aperiodic tilings of the space				
The seminar often hosts foreign researcher. Students participate actively in solution of open problems in the field.				
01ASM	Application of Statistical Methods	KZ	2	
The course focuse	s on applications of selected methods of statistical data analysis to concrete problems including their solutions using statistical softw	are. Namely we wi	II deal with:	
hypothe	eses tests about parameters of normal distribution, nonparametric methods, contingency tables, linear regression and correlation, an	alysis of variance.		
01ASY	Asymptotical Methods	Z,ZK	3	
Examples. Addition	on parts of mathematical analysis (generalized Lebesgue integral, parametric integrals.) Asymptotic relations a expansions - propertie	es; algebraical and	analytical	
	operations. Applied asymptotics of sequences and sums; integrals of Laplace and Fourier type.			
01DPMM1	Master Thesis 1	Z	10	
	Master's thesis preparation.			
01DPMM2	Master Thesis 2	Z	20	
	Master's thesis preparation.			
01DPV	Differential Calculus on Manifolds	ZK	2	
Smooth manifold, ta	angent space differential forms, tensors, Riemannian metrics and manifold, covariant derivative, parallel transport, orientation of manil	fold, itegration on n	nanifold and	
	Stokes theorem.			
01DRO1	Dynamic Decision Making 1	ZK	2	
Design, control an	d analysis of intelligent agents (or systems) that behave appropriately in various circumstances are highly demanded (artificial intelli	gence and machin	e learning,	
data mining, financi	al modelling, natural language processing, bioinformatics, web search and information retrieval, algorithm design, system design, netw	vork analysis, and	more). Such	
intelligent agents r	need to reason with uncertain information and limited computational resources. Effective decision making requires the knowledge ab	out: . the agent's er	nvironment	
and its dynamics (including the presence of other intelligent agents), the agent's goals and preferences the agent's abilities to observe and influence	the environment.	This course	
introduces dynamic decision making under uncertainty and computational methods supporting decision-making. The course helps to develop the mathematical reasoning skills crucial				
for areas inherently involving uncertainty. These skills can serve as the foundation for further study in any application area you choose to pursue and may also help you to analyse the				
uncertainty in your everyday life. Course objectives: - Learn the basic ideas and techniques underlying design of intelligent rational agents. A specific emphasis will be on the				
for a given task/ar			S LIAR) -	
	Try out some ideas of your own		o, ionity	
<u> </u>				

01DRO2	Dynamic Decision Making 2	ZK	2
1.Overview of the	formalised decision-making task and tools for its solution 2. Application of the general fully probabilistic design of decision-making stra	ategies for Markov	chains and
linear-Gaussian	models 3. Aproximation and completion of probabilities serving to processing data-based as well as probabilistic knowledge and pret	ferences for Marko	v chains
4.Introduction into r	nulti-participants decision making and its formalisation 5. Usability of general tools for knowledge sharing and cooperation within multipl	e-participants deci	sion making
	6. Ilustrative case studies of solving decision-making tasks 7. Open decision-making problems		
01DSEMI	Diploma Seminar	Z	3
	Preparation of the thesis defense.		
01DYRO	Dynamic Decision Making	ZK	4
01FA3	Functional Analysis 3	Z,ZK	3
	Advanced parts of functional analysis needed for modern quantum theory.		
01FIMA	Financial and Insurance Mathematics	ZK	2
	This course is an introduction to the problems of life and non-life insurance and financial mathematics.		
01KF	Quantum Physics	Z,ZK	6
	Basic quantum theory presented via rigorous mathematical methods.	-	
01LOM	Logic for Mathematicians	ZK	2
01MADR	Calculus Revisited	Z	2
The term function -	development of the term; misleading character of generality of the term; 'a statistical aspect'; discontinuous functions are still 'close' to d	continuous ones Li	mit passage
- supremum, lims	up, lim have the same scheme; definition of term filter; usage of filter for all limit passages Problem of definition of the length of curve	e - classical approa	ch and its
problems; term cu	Irve in analysis; the necessity of defining new terms: rectifiable curve; Lebesgue's approach (leads to necessity of definition of new in	tegral - Lebesgue'	s integral);
functional approac	h: curve length as a lower semi-continuous functional in curve space Integral theory - historical introduction; determination of surface	area of complex f	igure; effort
for finding an unive	ersal methodology: Cauchy's approach, Riemann's approach; persisting problems lead Lebesgue to a definition of a new integral; the	two fundamental I	_ebesgue's
thoughts; Lebes	gue's measure and measurability; existence (and construction) of unmeasurable set (in Lebesgue sense) and the axiom of choice; co	mparison of Riem	ann's and
Lebesgu	e's integral and finding the essence of difference; weak spots of Lebesgue's integral; the essence of measure theory; new perspective	es in integral theor	у
01MAL	Mathematical Logic	Z,ZK	4
Logic is in the sam	e time an object studied by mathematics and the language used to formalize and study mathematics. The goal of the course is to int	roduce basic notio	n of results
of classical mathem	natical logic. 1. Propositions, evaluation, tautologies, axioms, theorems, soundness, completeness, and decidability of Hilbert and Gen	tzen style propositi	onal calculi.
2.Language of pr	edicate calculus, terms, formulas, relational structures, satisfiability, truth, tautologies, axioms, theorems, soundness, model construc	tions. 3.Gödel com	pleteness
theorem, Sk	colem and Herbrand theorems. 4. The first and the second Gödel theorems on incompleteness of Peano arithmetics and undecidabilit	y of predicate calc	ulus.
01MBI	Mathematical Methods in Biology and Medicine	KZ	3
Spatially independe	ent models; enzyme kinetics; excitable system; reaction-diffusion equations; travelling waves; pattern formation; conditions for Turing i	instability, the effect	t of domain
	size; the concept of stability in PDEs, spectrum of a linear operator, semigroups		
01MKO	Method of Finite Volumes	KZ	2
The subject is dev	oted to the numerical solutions of linear partial differential equations of first and second order using the finite difference and the finite	volume methods.	The lecture
discuss	es the basic properties of numerical methods for solving elliptic, parabolic and hyperbolic equations, the modified equation and the n	umerical viscosity.	
01MKP	Finite Element Method	ZK	3
The course is devo	ted to the mathematical theory of the finite element method numerically solving boundary-value and initial-boundary-value problems for	or partial differentia	I equations.
	Mathematical properties of the method are explained. The approximation error estimates are derived.		
01MLO	Logic for Mathematicians	ZK	2
01MMDT1	Mathematical Methods in Fluid Dynamics 1	Z	2
The contents of	the course is the introduction to mathematical methods in fluid dynamice. Concretely: mathematical modelling of fundamentals physic	cal laws by means	of partial
differential equatio	ns, formulation of associated boundary or initial-boundary value problems for various type sof fluids as well as various type sof flows.	, properties and so	me speciál
	solutions of these problems.		
01MMDT2	Mathematical Methods in Fluid Dynamics	ZK	2
The course is devo	ted to mathematical fundamentals of fluid mechanics models, classical and advanced finite difference and finite volume techniques a	pplied to numerica	I solution of
	simplified problems as well as multi - dimensional problems of inviscid and viscous flow.		
01MMNS	Mathematical Modelling of Non-linear Systems	ZK	3
The course consis	ts of basic terms and results of the theory of finite- and infinitedimensional dynamical systems generated by evolutionary differential	equations, and de	scription of
bifurca	ations and chaos. Second part is devoted to the explanation of basic results of the fractal geometry dealing with attractors of such dyn	namical systems.	
01MRM	Methods for Sparse Matrices	ZK	2
The course is aim	ed at utilization of sparse matrices in direct methods for solution of large systems of linear algebraic equations. The course will cover	the decompositior	theory for
symmetric and p	ositive definite matrices. Theoretic results will be further applied for solution of more general systems. Main features of the methods a	ind common imple	mentation
	issues will be covered.		
01NAH	Theory of Random Processes	ZK	3
The course is devot	ted in part to the basic notions of the general theory of random processes and partially to the theory of stationary processes and seque	nces both weakly	and strongly
	stationary ones.		
01NELI	Nonlinear Programming	ZK	4
Nonlinear optimizat	ion problems find their application in may areas of applied mathematics. The lecture covers the basics of mathematical programming the	eory with emphasi	s on convex
	optimization and basic methods for unconstrained and constrained optimization. The lecture is supplemented by illustrative exar	nples.	
01NEUR1	Neural Networks and their Applications 1	ZK	2
_	Keywords: Neural networks, data separation, functional approximation, supervised learning	I	I
01NEUR2	Theoretical Fundamentals of Neural Networks	ZK	3
	Keywords: Functional approximation, supervised learning, Vapnik-Chervonenkis-dimension		-
01NSAP	Neural Computers and Their Applications	7K	4
Introduction into	the theory of artificial neural networks, some important kinds of neural networks, threshold vectors analysis of binary nets neural net	works evaluation of	f Boolean
functions, neural r	networks from the point of view of function approximation. neural networks from the point of view of probability theory, numerical prop	erties of learning	algorithms.
	Numerical Simulations of Convection Problems	k7	2
Students will be ac	quainted with the 2D and 3D numerical simulations of flow problems described by potential inviscid and viscous flow. It is a transprint	tlow around a wir	a profile in
a 2D and 3D lattic	e, in 2D and 3D channels of different shape, in the boundary layer, and in the modeling of cardiovascular problems. Some cases of t	urbulent flow simu	lations are
	also mentioned.		
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	Numerical Software	7	3
The course deals	with the implementation of several numerical methods in existing software libraries. The attention will be paid to libraries for solution of	of problems of linea	ar algebra
	with full and sparse matrices, and to the solution of ODE and PDE		J.
01PAA	Parallel Algorithms and Architectures	KZ	4
This course deals	with the parallel data processing. It is important in situations when one processing unit (CPU) is not powerful enough to finish given ta	ask in reasonable t	ime. When
design	ng parallel algorithms, good knowledge of the parallel architectures is important. Therefore these architectures are studied as a part of	of this course too.	
01PALG	Advanced Algorithmization	KZ	2
Keywo	ds: String algorithms, graph algorithms, dynamic programming, suffix tress, graph cuts, numerical methods for solution of partial diffe	erential equations.	
01PDR	Modern Theory of Partial Differential Equations	ZK	2
Sobolev spaces, co	ntinuous and compact embedding theorems, trace theorem. Elliptic PDE of Second Order, Lax-Milgram theorem, regularity, maximum	principle, harmoni	c functions.
01PMU	Probabilistic Learning Models	ZK	2
Introduction into the	e theory PAC learning model, VC-dimension of finite sets, Sauer, Cover and Radon's lemma, VC-dimension of composed mappings,	application of VC-	dimension
for lower bound of	ecessary patterns, analysis of properties of delta rule based learning processes, PAC learning model extensions and PAO learning,	Fourier coefficients	s search for
	Boolean functions.		
01PNLA	Advanced Methods of Numerical Linear Algebra	ZK	3
Representation of I	eal numbers in computers, behaviour of rounding errors during numerical computations, sensitivity of a problem, numerical stability of	an algorithm. We	will analyse
sensitivity of the ei	genvalues of a given matrix and sensitivity of roots of systems of linear algebraic equations. Then, the backward analysis of these pro	blems will be perfo	ormed. The
second part of the	ourse is devoted to the methods of QR-decomposition, least squares problem, and to several modern Krylov subspace methods for th	e solution of syster	ms of linear
	algebraic equations and the Lanczos method for approximation of the eigenvalues of a symmetric square matrix.		
01REAN	Regression Data Analysis	Z,ZK	4
	Key words: Regression model, cross-sectinal and panel data, classical and robust estimators.		
01REGA	Regression Data Analysis	ZK	2
	Classical and robust regression analysis, estimators, diagnostics, time series, dynamic model.	·	
01ROZ1	Image Processing and Pattern Recognition 1	ZK	4
An introductory cou	rse on image processing and pattern recognition. Major attention is paid to image sampling and quantization, image preprocessing (nois	e removal, contrast	t stretching,
sharpening, and de	-blurring, Wiener filtering, blind deconvolution), edge detection, morphology and geometric transformations and warping. Numerous a	applications and ex	perimental
	results are presented in addition to the theory.		
01ROZP2	Image Processing and Pattern Recognition 2	ZK	4
The course is a co	ntinuation of ROZ1. Major attention is paid to features for shape description and recognition, and to general pattern recognition techni	iques. Numerous a	pplications
	and experimental results are presented in addition to the theory.		
01SFTO	Special Functions and Transformations in Image Analysis	ZK	2
The course broad	ens topics of the courses ROZ1 and ROZ2. Main attention will be paid to several special functions and transformations (especially mo	oment functions an	d wavelet
transform) and thei	use in selected tasks of image processing - edge detection, noise removal, recognition of deformed objects, image registration, image	ge compression, et	tc. Both the
	theory and practical applications will be discussed.		
01STOM	Stochastic Methods	KZ	2
ĸ	eywords: Markov processes, transition probabilities, stationary distribution, hitting probabilities, transition rates, Poisson process, que	uing theory.	
01STOS	Stochastic Systems	ZK	2
The course is devo	ted to the theory of Markov processes as mathematical models for stochastic systems, i.e. dynamic systems influenced by randomne	ess. The main goal	consists in
investigating the til	ne limit behavior for different instances according the type of the system states. The models with discrete and continuous time are dis	stinguished, an app	lication for
	practical tasks is demonstrated, in particular for queuing systems.		
01SVK	Student's Scientific Conference	Z	1
This	is the active participation of the student in one of the approved student conferences. The list of such conferences is defined by the co		
01TC	·· · · —·	urse guarantor.	I
	Number Theory	urse guarantor.	4
	Number Theory The subject is devoted to number theory with focus on continued fractions and fundamentals of algebraic number theory.	urse guarantor.	4
01TEMA	Number I heory The subject is devoted to number theory with focus on continued fractions and fundamentals of algebraic number theory. Matrix Theory	urse guarantor.	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					
01ZPB1	Introduction to Computer Security 1	Z	2		
01ZPB2	Introduction to Computer Security 2	Z	2		
01ZSIG	Diagnostic Signal Processing	ZK	3		
The course is devoted to modern techniques of the analog and digital signal processing used in physics, measurements and information science. Basic signal transforms and their					
discrete equivalents are explained to describe signals and their transfer in different representations. Practical training is based on MATLAB software with Signal and Wavelet Toolboxes.					
01ZTG	Introduction to Graph Theory	ZK	4		
02LIAG	Lie Algebras and Lie Groups	Z,ZK	6		
Definitions and properties of Lie groups and Lie algebras. Different types of Lie algebras, root systems and classification of complex simple Lie algebras. Introduction to theory of					
representations.					
02SPEC	Geometrical Aspects of Spectral Theory	ZK	2		
Spectral theory is a	n extremely rich field which has found its application in many areas of physics and mathematics. One of the reason which makes it s	o attractive on the	formal level		
is that it provides a	unifying framework for problems in various branches of mathematics, for example partial differential equations, calculus of variations,	geometry, stochas	tic analysis,		
etc. The goal of the lecture is to acquaint the students with spectral methods in the theory of linear differential operators coming both from modern as well as classical physics, with a					
special emphasis put on geometrically induced spectral properties. We give an overview of both classical results and recent developments in the field, and we wish to always do it by					
providing a physical interpretation of the mathematical theorems.					
12DRP	Differential Equations on Computer	Z,ZK	5		
Ordinary differential equations, analytical methods; Ordinary differential equations, numerical methods, Runge-Kutta methods, stability; Partial differential equations, analysis, hyperbolik,					
parabolic and elliptic equations, posedness of differential equations; Partial differential equations, numerical solution, finite difference methods, difference schemes, order of approximation,					
stability, convergence, modified equation, diffusion, dispersion; Conservation laws and their numerical solution, shallow water equations, Euler equations, Lagrangian methods, ALE					
	methods; Practical computation in Matlab system for numerics and Maple for analysis of schemes.				
18DAIS	Database System Decomposition	KZ	4		
The lectures are oriented to basic terms, database objects, their properties and relationships together with the accent to logics of decomposition and applications of database operations.					
18MMC	Monte Carlo Method	Z	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.					

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2024-05-17, time 04:05.