Study plan

Name of study plan: Aplikované matematicko-stochastické metody

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Applied Mathematical Stochastic Methods
Type of study: Bachelor full-time
Required credits: 4
Elective courses credits: 176
Sum of credits in the plan: 180
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: BSPAMSM1
Name of the group: BS P_AMSMB 1st year
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 12 courses
Credits in the group: 0
Note on the group: Examination in 01MANZ can be taken provided the assessment in 01MAN is obtained.Examination in 01LALZ can be taken provided the assessment in 01LAL is obtained.

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
02ELMA	**Electricity and Magnetism** *Iskender Yalcinkaya, Josef Schmidt, Jiří Hrivnák, Goce Chadzitaskos, Jan Vysoký* ***Jan Vysoký*** *Josef Schmidt (Gar.)*	Z,ZK	6	4+2	L	P
01LAL	**Linear Algebra 1** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)*	Z	2	2P+2C		P
01LALZ	**Linear Algebra 1, exam** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)*	ZK	2	0P+0C		P
01LAL2	**Linear Algebra 2** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)*	Z,ZK	4	2P+2C		P
01MAN	**Calculus 1** *Pavel Strachota, Miroslav Kolář, Edita Pelantová* ***Pavel Strachota*** *Pavel Strachota (Gar.)*	Z	4	4+4		P
01MANZ	**Calculus 1, exam** *Pavel Strachota, Miroslav Kolář, Edita Pelantová* ***Pavel Strachota*** *Pavel Strachota (Gar.)*	ZK	4	0P+0C		P
01MAN2	**Calculus 2** *Miroslav Kolář, Edita Pelantová, Maksym Dreval* ***Edita Pelantová*** *Maksym Dreval (Gar.)*	Z,ZK	8	4P+4C		P
02MECH	**Mechanics** *David Březň* ***Antonín Hoskovec*** *David Březň (Gar.)*	Z	4	4+2	Z	P
02MECHZ	**Mechanics - Examination** *Iskender Yalcinkaya, Goce Chadzitaskos, Stanislav Skoupý, Petr Novotný, David Březň, Filip Petrásek, Antonín Hoskovec* ***Antonín Hoskovec*** *David Březň (Gar.)*	ZK	2	-	Z	P
00PT	**Preparatory Week** *Petr Ambrož, Milan Krbálek* ***Petr Ambrož*** *Petr Ambrož (Gar.)*	Z	2	týden	Z	P
18ZPRO	**Basics of Programming** *Maksym Dreval, Nichita Vatamaniuc, Jan Vondruška, Vladimír Jarý, Miroslav Virius, Jakub Klinkovský, Petr Pauš, František Voldřich, Jan Tomsa, ...* ***Miroslav Virius*** *Miroslav Virius (Gar.)*	Z	4	4C	Z	P

Characteristics of the courses of this group of Study Plan: Code=BSPAMSM1 Name=BS P_AMSMB 1st year

02ELMA	Electricity and Magnetism	Z,ZK	6
Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamic forces, magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, RLC circuits. Electromagnetic waves, Maxwell equations.			
01LAL	Linear Algebra 1	Z	2
1. Vector space. 2. Linear dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6. Matrices of linear mappings. 7. Frobenius theorem.			
01LALZ	Linear Algebra 1, exam	ZK	2
01LAL2	Linear Algebra 2	Z,ZK	4
Outline: 1. Inverse matrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. Hermitian and quadratic forms. 5. Scalar product and orthogonality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of inverse matrices. 2. Methods of calculation of determinants. 3. Calculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and orthogonality. Calculation of orthogonal complements. 6. Geometry exercises and examples. 7. Adjoint operators.			
01MAN	Calculus 1	Z	4
Basic calculus (real analysis, functions of one real variable, differential calculus).			
01MANZ	Calculus 1, exam	ZK	4
01MAN2	Calculus 2	Z,ZK	8
1. Continuation of differential calculus: Taylor´s Polynomials, Taylor´s formula 2. Infinite series: criteria of convergence, operations on series, absolute and conditional convergence 3. Real and complex power series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. Theory of integrals: primitives, definite integral (Riemann definition), techniques of integration and application of integrals, Generalized Riemann integral			
02MECH	Mechanics	Z	4
Introduction to physics, physical quantities and units. Kinematics of a particle, basic types of motion and their superposition. Dynamics of a particle, solving equations of motion for one-dimensional motion, motion in a central force field, forces in non-inertial reference frames. Mechanics of a system of particles, two-body problems, particle collisions. Mechanics of a rigid body, rotation.			
02MECHZ	Mechanics - Examination	ZK	2
The content of the subject is the examination according to the plan of studies.			
00PT	Preparatory Week	Z	2
18ZPRO	Basics of Programming	Z	4
This course is intended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in programming and with the Python programming language.			

Code of the group: BSPAMSM2
Name of the group: BS P_AMSMB 2nd year
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 8 courses
Credits in the group: 0
Note on the group: Examination in 02TEF1 can be taken only if 02MECHZ in passed.

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**
12ANM	**Applied Numerical Methods** *Pavel Váchal, Jan Pšikal, Alena Zavadilová* ***Alena Zavadilová*** *Jan Pšikal (Gar.)*	KZ	4	2+2	L	P
01ANB3	**Calculus B 3** *Miroslav Kolář, Milan Krbálek* ***Milan Krbálek*** *Miroslav Kolář (Gar.)*	Z,ZK	8	4P+4C		P
01ANB4	**Calculus B 4** *Jiří Mikyška, Miroslav Kolář* ***Jiří Mikyška*** *Milan Krbálek (Gar.)*	Z,ZK	6	2P+4C		P
01SAM	**Seminar of Applied Mathematics** *Milan Krbálek* ***Milan Krbálek*** *Milan Krbálek (Gar.)*	Z	2	0P+2S		P
02TEF1	**Theoretical Physics 1** *Petr Novotný* ***Michal Jex*** *Igor Jex (Gar.)*	Z,ZK	4	2+2	Z	P
01UP1	**Introduction to Probability 1** *Jan Vybíral* ***Jan Vybíral*** *Jan Vybíral (Gar.)*	Z,ZK	3	1P+1C		P
01UP2	**Introduction to Probability 2** *Milan Krbálek, Michaela Krbálková* ***Michaela Krbálková*** *Milan Krbálek (Gar.)*	Z,ZK	3	1P+1C		P
02VOAF	**Waves, Optics and Atomic Physics** *Josef Schmidt* ***Jan Vysoký*** *Jiří Tolar (Gar.)*	Z,ZK	6	4+2	Z	P

Characteristics of the courses of this group of Study Plan: Code=BSPAMSM2 Name=BS P_AMSMB 2nd year

12ANM	Applied Numerical Methods	KZ	4
For English version use code 12YNME1. There are explained the basic principles of numerical mathematics important for numerical solving of problems important for physics and technology. Methods for solution of tasks very important for physicists (ordinary differential equations, random numbers) are included in addition to the basic numerical methods. Integrated computational environment MATLAB is used as a demonstration tool. The seminars are held in computer laboratory and PASCAL is used as a principle programming language and MATLAB is also used.			

01ANB3	Calculus B 3	Z,ZK	8

1. Functional sequences and series - convergence range, criteria of uniform convergence, continuity, limit, differentiation and integration of functional series, power series, Series Expansion, Taylor´s theorem. 2. Ordinary differential equations - equations of first order (method of integration factor, equation of Bernoulli, separation of variables, homogeneous equation and exact equation) and equations of higher order (fundamental system, reduction of order, variation of parameters, equations with constant coefficients and special right-hand side, Euler differential equation). 3. Metric spaces - metric, norm, scalar product, neighborhood, interior and exterior points, boundary point, isolated and non-isolated point, boundary of set, completeness of space, Hilbert spaces. Orthogonal polynomials. Complete orthogonal systems. 4. Fourier series - expansion of functions into Fourier series, trigonometric Fourier series and their convergence. 5. Differential calculus of functions of several variables - limit, continuity, partial and directional derivative, gradient, total derivatives and tangent plane, Taylor series, elementary terms of vector analysis, Jacobi matrix. 6. Functions defined implicitly by one or several equations.

01ANB4	Calculus B 4	Z,ZK	6

[1] Diferenciální počet funkcí více proměnných a funkcionálních vektorů. [2] Funkce zadané implicitně. [3] Taylorovy řady funkce více proměnných. [4] Regulární zobrazení, záměna proměnných, nekartézské soustavy souřadnic. [5] Lokální, vázané a globální extrémy funkce více proměnných. [6] Základy teorie míry a obrys konstrukce Lebesgueovy míry. [7] Integrální počet funkce více proměnných - Riemannův a Lebesgueův integrál, základní vlastnosti, Fubiniova věta, věta o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální věty.

01SAM	Seminar of Applied Mathematics	Z	2

1. Defectoscopy and acoustic emission. 2. Machine learning. 3. Traffic flow dynamics. Dynamics of crowd movement. 4. Digital image processing. 5. Dynamic pricing. 6. Statistical predictions in economics, sociology and psychology. 7. Application of random matrix theory.

02TEF1	Theoretical Physics 1	Z,ZK	4

The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalisms as well as diferent approaches to description of dynamics (Newtons, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2).

01UP1	Introduction to Probability 1	Z,ZK	3

1.Random trial with finite set of possible results, classical probability, independent random events 2.Probability and combinatorics 3.Probability and geometry, Bertrands paradox 4.Conditional probability, Bayes theorem, medical diagnosis, Simpsons paradox 5.Random variable with discrete state space, its distribution and mean value 6.Problems involving the calculation of mean value 7.Probabilistic method in graph theory 8.Random algorithms, Morris algorithm and its variants

01UP2	Introduction to Probability 2	Z,ZK	3

1. One-dimensional continuous random variable and its statistical description. 2. Distribution function and probability density. 3. Axiomatic introduction of probability and connection to measure theory. 4. Numerical characteristics of continuous random variables. 5. Selected variants of continuous distributions and their characteristics. 6. Elementary methods for point estimations. 7. Generating pseudorandom numbers from the selected distribution.

02VOAF	Waves, Optics and Atomic Physics	Z,ZK	6

Wave phenomena in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polarization, interference, diffraction, coherence. Geometrical optics. Introduction to quantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves,the Schrodinger equation, stationary states and spectra of finite systems.

Code of the group: BSPAMSM3
Name of the group: BS P_AMSMB 3rd year
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 12 courses
Credits in the group: 0
Note on the group: Examination in 01RMAF can be taken only if all courses in Calculus and Linear Algebra are passed.

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
01BPAM1	**Bachelor Thesis 1** *Pavel Strachota, Václav Kůs* ***Pavel Strachota*** *Pavel Strachota (Gar.)*	Z	5	0+5		P
01BPAM2	**Bachelor Thesis 2** *Pavel Strachota* ***Pavel Strachota*** *Pavel Strachota (Gar.)*	Z	10	0+10		P
01LIP	**Linear Programming** *Jan Volec* ***Jan Volec*** *Jan Volec (Gar.)*	Z,ZK	3	2+1	Z	P
01MAPR	**Markov processes** *Jan Vybíral* ***Jan Vybíral*** *Jan Vybíral (Gar.)*	Z,ZK	4	2+2		P
01MAS	**Mathematical Statistics** *Václav Kůs* ***Václav Kůs*** *Václav Kůs (Gar.)*	ZK	3	2+0		P
01MASC	**Mathematical Statistics - Seminar** *Tomáš Hobza* ***Tomáš Hobza*** *Tomáš Hobza (Gar.)*	Z	2	0+2		P
01CAS	**Matematics for Particle Systems** *Milan Krbálek* ***Milan Krbálek*** *Milan Krbálek (Gar.)*	Z,ZK	3	2P+1C		P
01MIP	**Measure and Probability** *Václav Kůs, Tomáš Hobza* ***Tomáš Hobza*** *Václav Kůs (Gar.)*	Z,ZK	6	4+2		P
01RMFB	**Equations of Mathematical Physics B** ***Václav Klika***	Z,ZK	5	2P+2C		P
01BASE	**Bachelor Seminar** ***Pavel Strachota*** *Pavel Strachota (Gar.)*	Z	1	0P+2S		P
01STME	**Statistical Methods with Applications** *Tomáš Hobza* ***Tomáš Hobza*** *Tomáš Hobza (Gar.)*	ZK	2	2P+0C		P
01USU	**Introduction to Machine Learning** *Jiří Franc, Jan Flusser* ***Jiří Franc*** *Jan Flusser (Gar.)*	Z,ZK	4	2P+2C		P

Characteristics of the courses of this group of Study Plan: Code=BSPAMSM3 Name=BS P_AMSMB 3rd year

01BPAM1	Bachelor Thesis 1	Z	5
Bachelor's Degree project on the selected topic under the supervision. Supervision and regular checking of the bachalor project under preparation.			
01BPAM2	Bachelor Thesis 2	Z	10
Bachelor's Degree project on the selected topic under the supervision. Supervision and regular checking of the bachalor project under preparation.			
01LIP	Linear Programming	Z,ZK	3
We study special problems about constrained extremal problems for multivariable functions, where the function is linear and the constraints are given by linear equations and/or linear inequalities.			
01MAPR	Markov processes	Z,ZK	4
01MAS	Mathematical Statistics	ZK	3
The subject is devoted to usage of statistical methods studied in the course of Mathematical statistics. We deal with Fisher information matrix of statistical models, finding unbiased estimators with minimal variance, parameter estimation by method of moments and method of maximum likelihood, derivation of critical regions for hypothesis testing using the Neyman-Pearson lemma and likelihood ratio, confidence intervals and non-parametric density estimation.			
01MASC	Mathematical Statistics - Seminar	Z	2
The subject is devoted to practical use of statistical methods studied in the course Mathematical Statistics 01MAS. The tutorial deals with calculation of Fisher information matrix of statistical models, finding unbiased estimators with minimal variance, parameter estimation by method of moments and method of maximum likelihood, derivation of critical regions for hypothesis testing using the Neyman-Pearson lemma and likelihood ratio, calculation of confidence intervals and non-parametric density estimation.			
01CAS	Matematics for Particle Systems	Z,ZK	3
The aim of the course is to study general mathematical properties of one-dimensional stochastic particle systems whose elements are interacting. Especially, systems fulfilling a so-called balance property are analyzed. For such systems, statistical distributions of headways and multi-headways, interval frequencies, and associate statistical rigidity are examined.			
01MIP	Measure and Probability	Z,ZK	6
The subject is devoted to the introduction to Theory of probability on measure-theoretic level for discrete models, continuous distributions and general distributions of random variables. We deal with the examples of distributions including multi-dimensional Gaussian distribution and their properties. Further the (non)+integral characteristics of random variables (E, Var,...), convergence modes (Lp, P, a.s., D) and variants of limit theorems are derived (LLN, CLT).			
01RMFB	Equations of Mathematical Physics B	Z,ZK	5
The subject of this course is solving integral equations, theory of generalized functions, classification of partial differential equations, theory of integral transformations, and solution of partial differential equations.			
01BASE	Bachelor Seminar	Z	1
In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelors degree projects at the faculty. The second part is designed as a practical training for the defense of the bachelors degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the students performance.			
01STME	Statistical Methods with Applications	ZK	2
The course consists of selected methods of statistical data analysis such as: linear regression and correlation, analysis of variance, nonparametric methods, contingency tables, and their application. The aim is to illustrate the use of statistical procedures on examples. Solutions of concrete examples by use of statistical software are also included.			
01USU	Introduction to Machine Learning	Z,ZK	4
The aim of this course is to provide a broad introduction to machine learning, data mining and statistical image recognition. Main attention is paid to the basic methods of learning with the teacher, cluster analysis and dimensionality reduction. The lectures and theory explanation is accompanied by examples of experiments and practical applications. Exercises use Python and run in computer labs with emphasis on the implementation and use of machine learning algorithms applied to real data from practical problems.			

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 4
The role of the block: PV

Code of the group: BSPAMSMPV2
Name of the group: BS P_AMSM Required optional courses 2nd year
Requirement credits in the group: In this group you have to gain at least 4 credits
Requirement courses in the group:
Credits in the group: 4
Note on the group: Student je povinen z uvedené skupiny předmětů získat alespoň 4 kredity.

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
18PMTL	**Programming in MATLAB** *Matěj Pokorný, Quang Van Tran, Jaromír Kukal* ***Quang Van Tran*** *Jaromír Kukal (Gar.)*	KZ	4	4C	Z	PV
18PPY2	**Programming in Python 2** *Jakub Klinkovský* ***Jakub Klinkovský*** *Jakub Klinkovský (Gar.)*	Z	2	2S	Z	PV
18PPY3	**Programming in Python 3** *Rudolf Pecinovský* ***Jakub Klinkovský*** *Jakub Klinkovský (Gar.)*	Z	2	2C	L	PV
02TSFA	**Thermodynamics and Statistical Physics** *Igor Jex, Jaroslav Novotný* ***Antonín Hoskovec*** *Igor Jex (Gar.)*	Z,ZK	4	2+2	L	PV

Characteristics of the courses of this group of Study Plan: Code=BSPAMSMPV2 Name=BS P_AMSM Required optional courses 2nd year

18PMTL	Programming in MATLAB	KZ	4
Introducing Matlab environment as efficient tool for computation in complex arrays and symbolic variables, namely for linear algebra, mathematic analysis, statistics, algorithmization and geometric representation of results.			

18PPY2	Programming in Python 2	Z	2
This course introduces students to practical applications of the Python language in scientific as well as commercial fields. The course is a seminar where each presented topic is accompanied by a short demo of a real-world application in the specific field.			
18PPY3	Programming in Python 3	Z	2
This advanced course is intended for students who have basic experience with programming in Python and using its libraries. It introduces students to advanced concepts of the Python language and modules they are based on.			
02TSFA	Thermodynamics and Statistical Physics	Z,ZK	4
Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect,conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is usedto discusses simple transport phenomena.			

Code of the group: BSSPOLVEDY
Name of the group: BS - Social Sciences
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 0
Note on the group: Only one of these courses is obligatory.

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
00EKOT	**Economy in Technology** ***Jana Kovářová***	Z	1	2+0		PV
00ETV	**Ethics of Science and Technology** *Jakub Hajíček* ***Jana Kovářová*** *Jakub Hajíček (Gar.)*	Z	1	0+2	L	PV
00RET	**Rhetoric** *Jana Kovářová* ***Jana Kovářová*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	1	0+2		PV
00UPRA	**Introduction to Law** *Martin Čech* ***Jana Kovářová*** *Martin Čech (Gar.)*	Z	1	0+2		PV
00UPSY	**Introduction to Psychology** *Jakub Hajíček* ***Jana Kovářová*** *Jakub Hajíček (Gar.)*	Z	1	0+2		PV

Characteristics of the courses of this group of Study Plan: Code=BSSPOLVEDY Name=BS - Social Sciences

00EKOT	Economy in Technology	Z	1
The course introduces the basics of micro- and macroeconomics.			
00ETV	Ethics of Science and Technology	Z	1
00RET	Rhetoric	Z	1
The course is focused on the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the composition of public speech as well as to its nonverbal aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an integral part of the course.			
00UPRA	Introduction to Law	Z	1
00UPSY	Introduction to Psychology	Z	1

Code of the group: BSPJAZYKYZK
Name of the group: BS P languages
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 2 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
04XAMZK	**English for Intermediate Students Examination** *Jana Kovářová, Slavěna Brownová* ***Jana Kovářová*** *Jana Kovářová (Gar.)*	ZK	4		Z	PV
04XAPZK	**English for Advanced Students Examination** *Slavěna Brownová, Darren Copeland* ***Jana Kovářová*** *Darren Copeland (Gar.)*	ZK	4		Z	PV
04XCESZZK	**Czech for Foreigners Beginners - Examination** *Slavěna Brownová* ***Jana Kovářová*** *Jana Kovářová (Gar.)*	ZK	4		Z	PV
04XCESMZK	**Czech for Intermediate Students Examination** *Jana Kovářová* ***Jana Kovářová*** *Jana Kovářová (Gar.)*	ZK	4		Z	PV
04XCESPZK	**Czech for Foreign Students - Advanced Examination** *Jana Kovářová* ***Jana Kovářová*** *Jana Kovářová (Gar.)*	ZK	4		Z	PV
04XFMZK	**French for Intermediate Students Examination** *Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	ZK	4		Z	PV
04XFPZK	**French for Advanced Students Examination** *Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	ZK	4		Z	PV
04XFZZK	**French for Beginners Examination** *Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	ZK	3		L	PV

04XNMZK	**German for Intermediate Students Examination** *Miloslava Čechová* ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	ZK	4		Z	PV
04XNPZK	**German for Advanced Students Examination** *Miloslava Čechová* ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	ZK	4		Z	PV
04XRMZK	**Russian for Intermediate Students Examination** *Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	ZK	4		Z	PV
04XRPZK	**Russian for Advanced Students Examination** *Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	ZK	4		Z	PV
04XRZZK	**Russian for Beginners Examination** *Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	ZK	3		L	PV
04XSMZK	**Spanish for Intermediate Students Examination** *Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	4		Z	PV
04XSPZK	**Spanish for Advanced Students Examination** *Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	4		Z	PV
04XSZZK	**Spanish for Beginners Examination** *Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	3		L	PV

Characteristics of the courses of this group of Study Plan: Code=BSPJAZYKYZK Name=BS P languages

04XAMZK	English for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. The examination covers the AM1, AM2, and AM3 courses and consists of two parts - written (100 min) and oral (20-30 min). The student is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English courses.

04XAPZK	English for Advanced Students Examination	ZK	4

The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (100 min) and oral (30 min) and includes also oral presentation of a topic from the student´s field of study.

04XCESZZK	Czech for Foreigners Beginners - Examination	ZK	4

The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the 04XCESZ1,2,3 courses and can only be taken after successful completion of all three courses. Detailed information is to be obtained from the teacher.

04XCESMZK	Czech for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESM1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.

04XCESPZK	Czech for Foreign Students - Advanced Examination	ZK	4

The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESP1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.

04XFMZK	French for Intermediate Students Examination	ZK	4

The content is the examination as given by the study programme. The whole French programme is ended with an examination covering the contents of FM1-FM3. The examination consists of a written and oral part and is organized according to Examination Instructions, a document available on the web.

04XFPZK	French for Advanced Students Examination	ZK	4

The whole French program is ended with an examination covering the contents of FP1-FP3. The examination consists of a written and/or an oral part and is organized according to Examination Instructions, a document available on the web. Assessment of the presentation is included into the examination grading.

04XFZZK	French for Beginners Examination	ZK	3

The content is the examination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The examination is ruled by the document Instruction for examination. Its content covers the levels FZ1 - FZ5.

04XNMZK	German for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 assessment. More detailed information is to be obtained from the teacher.

04XNPZK	German for Advanced Students Examination	ZK	4

The course content is the examination as given by the study plan. The whole German for Advanced Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungraded assessment. More detailed information is to be obtained from the teacher.

04XRMZK	Russian for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher.

04XRPZK	Russian for Advanced Students Examination	ZK	4

The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher.

04XRZZK	Russian for Beginners Examination	ZK	3

The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RZ1 - RZ5. Students are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instructions by the teacher.

04XSMZK	Spanish for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. XSMZK examination consists of two parts: written and oral; to be eligible for the written part, students will have obtained non-graded assessment for course XSM3. Oral examination follows the written part.

04XSPZK	Spanish for Advanced Students Examination	ZK	4

The course content is the examination as given by the study plan. Examination XSPZK consists of two parts, namely oral and written. The prerequisite for admission to oral part is having passed the written test. Examination content is based on syllabi of courses XSP1, XSP2, and XSP3 or on an individual study plan of the student.

04XSZZK	Spanish for Beginners Examination	ZK	3

The course content is the examination as given by the study plan. Examination consists of two parts - written and oral. Student can register for oral examination only if he/she has passed the written examination test.

Name of the block: Elective courses

Minimal number of credits of the block: 0
The role of the block: V

Code of the group: BSPAMSMV
Name of the group: BS P_AMSM Optional courses
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
01TA	**Algebra and Calculus in Applications** *Lubomíra Dvořáková, Edita Pelantová **Lubomíra Dvořáková** Lubomíra Dvořáková (Gar.)*	ZK	2	2P+0C		v
02DEF1	**History of Physics 1** *Igor Jex Igor Jex (Gar.)*	Z	2	2+0	Z	v
02DEF2	**History of Physics 2** *Igor Jex Igor Jex (Gar.)*	Z	2	2+0	L	v
01DEM	**History of Mathematics** *Lubomíra Dvořáková **Lubomíra Dvořáková** Lubomíra Dvořáková (Gar.)*	Z	1	0+2	L	v
01DIM1	**Discrete Mathematics 1** *Lubomíra Dvořáková, Edita Pelantová, Zuzana Masáková **Lubomíra Dvořáková** Zuzana Masáková (Gar.)*	Z	2	2P+0C	Z	v
01DIM2	**Discrete Mathematics 2** *Edita Pelantová, Zuzana Masáková **Zuzana Masáková** Zuzana Masáková (Gar.)*	Z	2	2P+0C	L	v
01DIMA3	**Discrete Mathematics 3** *Lubomíra Dvořáková **Lubomíra Dvořáková** Lubomíra Dvořáková (Gar.)*	ZK	2	2P+0C		v
01FKO	**Functions of Complex Variable** *Severin Pošta, Pavel Šťovíček **Pavel Šťovíček** Pavel Šťovíček (Gar.)*	Z,ZK	3	2+1		v
01FANA1	**Functional Analysis 1** *Pavel Šťovíček **Pavel Šťovíček** Pavel Šťovíček (Gar.)*	Z,ZK	5	2P+2C		v
02FYS1	**Physical Seminar 1** *Filip Petrásek (Gar.)*	Z	2	0+2	Z	v
B0B36JUL	**Julia for optimization and learning** *Milan Papež, Šimon Soldát, Václav Mácha **Milan Papež** Milan Papež (Gar.)*	KZ	4	1P+3C	Z	v
04AKS	**English Conversation** ***Jana Kovářová** Jana Kovářová (Gar.)*	Z	1	0+2	L	v
00MAM1	**Essentials of High School Course 1** *David Břeň*	Z	1	0+1		v
00MAM2	**Essentials of High School Math Course 2** *Lukáš Heriban **Severin Pošta** Lukáš Heriban (Gar.)*	Z	1	0+1		v
18NES1	**Neural Networks 1** *Zuzana Petříčková **Zuzana Petříčková***	KZ	5	2P+2C	L	v
18NES2	**Neural Networks 2** *František Voldřich, Zuzana Petříčková **Zuzana Petříčková** Zuzana Petříčková (Gar.)*	KZ	3	0P+2C	L	v
01NME2	**Numerical Methods 2** *Michal Beneš **Michal Beneš** Michal Beneš (Gar.)*	KZ	2	2+0	L	v
15CH1	**General Chemistry 1** *Ondřej Holas, Petr Distler, Václav Čuba **Petr Distler** Petr Distler (Gar.)*	Z	3	2+1	Z	v
15CH2	**General Chemistry 2** *Ondřej Holas, Petr Distler, Václav Čuba **Petr Distler** Petr Distler (Gar.)*	Z,ZK	3	2+1	L	v
01PGR1	**Computer Graphics 1** *Pavel Strachota **Pavel Strachota** Pavel Strachota (Gar.)*	Z,ZK	2	1P+1C		v
01PGR2	**Computer Graphics 2** *Pavel Strachota **Pavel Strachota** Pavel Strachota (Gar.)*	Z,ZK	2	1P+1C		v
01PSR	**Principles of Statistical Decision Making** *Václav Kůs **Václav Kůs** Václav Kůs (Gar.)*	ZK	2	2+0	L	v
18PRC1	**Programming in C++ 1** *Vladimír Jarý, Miroslav Virius **Miroslav Virius** Miroslav Virius (Gar.)*	Z	4	2+2	Z	v
18PRC2	**Programming in C++ 2** *Vladimír Jarý, Miroslav Virius, Jakub Klinkovský **Miroslav Virius** Miroslav Virius (Gar.)*	KZ	4	2+2	L	v
18PPY1	**Programming in Python 1** *Jakub Klinkovský, Matej Mojzeš **Jakub Klinkovský** Jakub Klinkovský (Gar.)*	Z	2	2C	L	v
18PPY2	**Programming in Python 2** *Jakub Klinkovský **Jakub Klinkovský** Jakub Klinkovský (Gar.)*	Z	2	2S	Z	v
18PPY3	**Programming in Python 3** *Rudolf Pecinovský **Jakub Klinkovský** Jakub Klinkovský (Gar.)*	Z	2	2C	L	v

01PSL	**LaTeX - Publication Instrument** *Petr Ambrož* ***Petr Ambrož*** *Petr Ambrož (Gar.)*	Z	2	0+2	L	v
01SSM1	**Seminar of Contemporary Mathematics 1** ***Matěj Tušek*** *Edita Pelantová (Gar.)*	Z	2	0+2	Z	v
01SOS1	**Software Seminar 1** *Zdeněk Čulík* ***Zdeněk Čulík*** *Zdeněk Čulík (Gar.)*	Z	2	0+2	Z	v
01SOS2	**Software Seminar 2** *Zdeněk Čulík* ***Zdeněk Čulík*** *Zdeněk Čulík (Gar.)*	Z	2	0+2	L	v
TV-1	**Physical Education**	Z	1		Z	v
TV-2	**Physical Education**	Z	1		L	v
TV-3	**Physical education**	Z	1	0+2	Z	v
TV-4	**Physical education**	Z	1	0+2	L	v
02TER	**Heat and Molecular Physics** *Filip Petrásek* ***Petr Novotný*** *Petr Jizba (Gar.)*	Z,ZK	4	2+2	L	v
14TED	**Creating Electronic Documents** *Aleš Materna, Jiří Martinčík* ***Aleš Materna*** *Aleš Materna (Gar.)*	Z	2	26C		v
17UING	**Introduction to Engineering** *Jan Frýbort, Petr Haušild, Radek Mušálek* ***Jan Frýbort*** *Jan Frýbort (Gar.)*	KZ	3	2P+1C	Z	v
02UKP1	**Introduction to Curves and Surfaces** *Ladislav Hlavatý Ladislav Hlavatý (Gar.)*	Z	2	1P+1C	L	v
18UQI	**Introduction to quantum informatics** *Aleš Wodecki Aleš Wodecki (Gar.)*	Z	3	2P	L	v
12UNXAP	**Introduction to UNIX** *Milan Kuchařík* ***Milan Kuchařík*** *Milan Kuchařík (Gar.)*	Z	2	1P+1C	L	v
12UVP	**Introduction to Scientific Computing** *Milan Šiňor* ***Milan Šiňor*** *Milan Šiňor (Gar.)*	Z	2	1P+1C	L	v
12PYTH	**Scientific Programming in Python** *Pavel Váchal, Jakub Urban* ***Pavel Váchal*** *Pavel Váchal (Gar.)*	Z	2	0+2	L	v
18ZALG	**Basics of Algorithmization** *Vladimír Jarý, Miroslav Virius, Petr Pauš, František Voldřich, Jan Tomsa, Zuzana Petříčková, František Gašpar* ***Vladimír Jarý*** *Miroslav Virius (Gar.)*	Z,ZK	4	2+2	L	v

Characteristics of the courses of this group of Study Plan: Code=BSPAMSMV Name=BS P_AMSM Optional courses

18PPY2	Programming in Python 2	Z	2
This course introduces students to practical applications of the Python language in scientific as well as commercial fields. The course is a seminar where each presented topic is accompanied by a short demo of a real-world application in the specific field.			
18PPY3	Programming in Python 3	Z	2
This advanced course is intended for students who have basic experience with programming in Python and using its libraries. It introduces students to advanced concepts of the Python language and modules they are based on.			
01TA	Algebra and Calculus in Applications	ZK	2
We illustrate methods based on combination of (CONtinuous) calculus and discrete (disCRETE) structures, so calles concrete mathematics. Theorems are motivated by problems from informatics and they are illustrated on problems from informatics.			
02DEF1	History of Physics 1	Z	2
Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Physics in Helenistic period, Archimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kepler, Galileo, Huygens. The birth of physics as experimental science. Newton and his work.			
02DEF2	History of Physics 2	Z	2
Development of classical mechanics after Newton, Bernoulli's, Euler, Lagrange. Historical development of optics, corpuscular and wave approach. Electricity and magnetism - electrostatics, galvanism, electrodynamics and electromagnetism, Faraday and Maxwell. Thermodynamics and its laws, statistical physics, Boltzmann. The birth of modern quantum and relativistic physics, Planck and Einstein. Discovery of radioaktivity, structure of atom, atomic nucleus, Rutherford and Bohr. The way to nuclear energy, Elementary particles, standard model. The concept of Nature and Universe of today.			
01DEM	History of Mathematics	Z	1
The subject has the form of regular seminars where the members of the department of mathematics, but also invited speakers - specialists in the field - give their talks on varoius topics from the history of mathematics.			
01DIM1	Discrete Mathematics 1	Z	2
The seminar is devoted to elementary number theory and applications. It includes individual problem solving.			
01DIM2	Discrete Mathematics 2	Z	2
The seminar is devoted to recurrence relations. It includes individual problem solving.			
01DIMA3	Discrete Mathematics 3	ZK	2
Students get to know problems and methods of their solving from various parts of discrete mathematics. The seminar includes individual problem solving of ones own choice from the given literature.			
01FKO	Functions of Complex Variable	Z,ZK	3
The course starts from outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable are explained in detail: the derivative of a complex function and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, Cauchy's integral theorem, Morera's theorem, roots of a holomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy estimates, Laurent series, residue theorem.			
01FANA1	Functional Analysis 1	Z,ZK	5
02FYS1	Physical Seminar 1	Z	2
The seminar is devoted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physics presented in the course of Mechanics. The problems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equipments.			

B0B36JUL	Julia for optimization and learning	KZ	4
Julia programming language is increasingly known by the community for its suitability in the field of numerical calculations. The course consists of two parts. The first part presents the basics of Julia. The second part introduces mathematical optimization and its application in machine learning, statistics and optimal control of differential equations. While the first part shows the individual concepts of Julia, the second part combines them into longer logical sections of code. We explain each application theoretically. Students are encouraged both to write simple functions by themselves and compare them with already existing packages. The course ends with a final project. Students can either choose a topic connected to their theses or join a Kaggle competition with real data. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
04AKS	English Conversation	Z	1
The course will develop the student´s communication skills acquired throughout their previous studies. It aims to improve all aspects of oral communication. The student will develop their vocabulary for various communication situations and will master their communication strategy. They will also practise their listening skills in order to better follow and participate in discussions. The student will be trained to express their ideas clearly and according to current English usage, and become a more confident speaker.			
00MAM1	Essentials of High School Course 1	Z	1
Students are introduced to mathematical concepts and methods used in the introductory physics course.			
00MAM2	Essentials of High School Math Course 2	Z	1
Review of basics of high school mathematics.			
18NES1	Neural Networks 1	KZ	5
The aim of the course "Neural Networks 1" is to acquaint students with basic models of artificial neural networks, algorithms for their learning, and other related machine learning techniques. The goal is to teach students how to apply these models and methods to solve practical tasks.			
18NES2	Neural Networks 2	KZ	3
The aim of the course "Neural Networks 2" is to acquaint students with basic models of deep neural networks and teach them how to apply these models and methods to solve practical tasks.			
01NME2	Numerical Methods 2	KZ	2
The course is devoted to numerical solution of boundary-value problems and intial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations.			
15CH1	General Chemistry 1	Z	3
The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises.			
15CH2	General Chemistry 2	Z,ZK	3
The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises.			
01PGR1	Computer Graphics 1	Z,ZK	2
The first part of the two-semester "Computer Graphics" course is devoted to the specifics of digital display devices spanning from history up to the state of the art technologies. Further, a survey of fundamental problems in 2D computer graphics is given together with their solutions. Focus is put on mathematical description of problems and explanation of the corresponding algorithms using knowledge previously obtained in a variety of subjects available at FNSPE. The final part of the course covers the applications of computer graphics approaches in the process of authoring scientific documents and presentations.			
01PGR2	Computer Graphics 2	Z,ZK	2
The second part of the two-semester "Computer Graphics" course begins with a brief introduction to signal theory in the context of aliasing - a phenomenon ubiquitous in computer graphics. Further, a well structured survey of fundamental problems in 3D computer graphics is given together with their solutions, from the description of a 3D scene to its realistic rendering. Focus is put on mathematical description of problems and explanation of the corresponding algorithms using knowledge previously obtained in a variety of subjects available at FNSPE. The algorithm implementation aspect such as data structures design etc. is also a matter of concern. In the last lecture, a number of theoretical concepts are demonstrated using Blender, an open-source 3D modeling and rendering software instrument.			
01PSR	Principles of Statistical Decision Making	ZK	2
The subject is devoted to the statistical techniques for general decision procedures based on optimization of suitable stochastic criterion, their mutual comparisons with respect to their properties and applicability.			
18PRC1	Programming in C++ 1	Z	4
This course covers mainly the C programming language and non-object oriented features of the C++ language.			
18PRC2	Programming in C++ 2	KZ	4
This course covers the object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Template Library.			
18PPY1	Programming in Python 1	Z	2
This course introduces students to advanced features of the Python language and common scientific packages. The course covers both object-oriented as well as functional programming paradigms. The following part of the course describes the use of Python in the fields of scientific and technical computing (NumPy and SciPy packages), data processing and visualization.			
01PSL	LaTeX - Publication Instrument	Z	2
The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX			
01SSM1	Seminar of Contemporary Mathematics 1	Z	2
This seminar provides a different approach to those fields of mathematics that are included in curriculum but also to those that are not part of basic courses of mathematics.			
01SOS1	Software Seminar 1	Z	2
Java, Java Beans, Assembly language programming for microprocessors Intel 80x86			
01SOS2	Software Seminar 2	Z	2
Graphical libraries GTK+ and Qt. Development of graphical user interface using C and C++ programming languages. Portable applications for Unix like operating systems, especially for Linux systems. Portability to Microsoft Windows.			
TV-1	Physical Education	Z	1
TV-2	Physical Education	Z	1
TV-3	Physical education	Z	1
TV-4	Physical education	Z	1
02TER	Heat and Molecular Physics	Z,ZK	4
Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution,equipartition theorem.			
14TED	Creating Electronic Documents	Z	2
Basic skills for creating and presenting student theses. Individual exercises focus on creating and formatting texts, equations, charts, tables, presentations and entire documents in an office suite.			

17UING	Introduction to Engineering	KZ	3
This course provides introduction to engineering skills. Students should gain general engineering skills at basic level (e.g. material properties and behavior, basics of manufacturing and production, quality assurance, environmental impacts,). In addition, the introduction to scientific work and technical drawing will be included.			
02UKP1	Introduction to Curves and Surfaces	Z	2
The goal of the lecture is an introduction to the differential geometry of simple manifolds - curves and two-dimensional surfaces. The basic concepts for the curves are introduced Frenets formulae are explained. In the surface theory we introduce first and second fundamental forms and mean and Gaussian curvature. Essential part of the lecture are the examples calculated by students.			
18UQI	Introduction to quantum informatics	Z	3
Quantum information has been on the rise for years. In this course, we explore the basics of quantum information theory with a strong emphasis on quantum computing. We discuss some of the most important quantum principles that lead to the so called quantum advantage and discuss many important quantum algorithms with the requisite amount of theoretical underpinning.			
12UNXAP	Introduction to UNIX	Z	2
Computer and operating systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interface. Hardware and software. Principles of operating systems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working with files. Text editors: vi, emacs. Command interpreter (shell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard tools. Graphical user interface X-windows. Computer networks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications			
12UVP	Introduction to Scientific Computing	Z	2
Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom.Students get acquinted with some basic tools fort scientific and technicval computing, data analysis, data visualisation and algorithm development.			
12PYTH	Scientific Programming in Python	Z	2
The aim of this course is to learn the fundamentals of the modern Python programming language with a focus on scientific computing. Emphasis is placed on effective solutions to real problems. The course is performed in an interactive form of practical exercises, whose topics can be tailored to the content of other subjects or student theses. Students are also involved in ongoing research. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented or functional programming. The greater part of the course focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciPy and the Matplotlib graphics library. We show how to generate efficient code, how to combine Python with other languages, what tools are available.			
18ZALG	Basics of Algorithmization	Z,ZK	4
This course is devoted to selected algorithms and methods for algorithm design. This course intruduces selected methods for the determination of the algorithm complexity.			

Code of the group: BSPJAZYKYZAP
Name of the group: BS P jazyky zap
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
04XAM1	**English for Intermediate Students M1** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XAM2	**English for Intermediate Students M2** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	L	v
04XAM3	**English for Intermediate Students M3** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XAP1	**English for Advanced Students P1** ***Jana Kovářová*** *Darren Copeland (Gar.)*	Z	2	0+2	Z	v
04XAP2	**English for Advanced Students P2** ***Jana Kovářová*** *Darren Copeland (Gar.)*	Z	2	0+2	L	v
04XAP3	**English for Advanced Students P3** ***Jana Kovářová*** *Darren Copeland (Gar.)*	Z	2	0+2	Z	v
04XCESZ1	**Czech for Foreigners - Beginners 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XCESZ2	**Czech for Foreigners - Beginners 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	L	v
04XCESZ3	**Czech for Foreigners - Beginners 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	2S	Z	v
04XCESM1	**Czech for Foreigners - Intermediate 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XCESM2	**Czech for Foreigners - Intermediate 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	L	v
04XCESM3	**Czech for Foreigners - Intermediate 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XCESP1	**Czech for Foreign Students - Advanced 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XCESP2	**Czech for Foreigners - Advanced 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	L	v
04XCESP3	**Czech for Foreigners - Advanced 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)*	Z	2	0+2	Z	v
04XFM1	**French for Intermediate Students M1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	Z	v

04XFM2	**French for Intermediate Students M2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	L	v
04XFM3	**French for Intermediate Students M3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	Z	v
04XFP1	**French for Advanced Students P1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	Z	v
04XFP2	**French for Advanced Students P2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	L	v
04XFP3	**French for Advanded Students P3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+2	Z	v
04XFZ1	**French for Beginners Z1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+4	L	v
04XFZ2	**French for Beginners Z2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+4	Z	v
04XFZ3	**French for Beginners Z3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+4	L	v
04XFZ4	**French for Beginners Z4** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+4	Z	v
04XFZ5	**French for Beginners Z5** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)*	Z	2	0+4	L	v
04XNM2	**German for Intermediate Students M2** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	L	v
04XNM1	**German for Intermediate Students M1** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	Z	v
04XNM3	**German for Intermediate Students M3** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	Z	v
04XNP1	**German for Advanced Students P1** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	Z	v
04XNP2	**German for Advanced Students P2** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	L	v
04XNP3	**German for Advanced Students P3** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)*	Z	2	0+2	Z	v
04XRM1	**Russian for Intermediate Students M1** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	Z	v
04XRM2	**Russian for Intermediate Students M2** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	L	v
04XRM3	**Russian for Intermediate Students M3** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	Z	v
04XRP1	**Russian for Advanced Students P1** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	Z	v
04XRP2	**Russian for Advanced Students P2** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	L	v
04XRP3	**Russian for Advanced Students P3** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+2	Z	v
04XRZ1	**Russian for Beginners Z1** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+4	L	v
04XRZ2	**Russian for Beginners Z2** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+4	Z	v
04XRZ3	**Russian for Beginners Z3** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+4	L	v
04XRZ4	**Russian for Beginners Z4** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+4	Z	v
04XRZ5	**Russian for Beginners Z5** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)*	Z	2	0+4	L	v
04XSM1	**Spanish for Intermediate Students M1** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	Z	v
04XSM2	**Spanish for Intermediate Students M3** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	L	v
04XSM3	**Spanish for Intermediate Students M3** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	Z	v
04XSP1	**Spanish for Advanced Students P1** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	Z	v
04XSP2	**Spanish for Advanced Students P2** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	L	v
04XSP3	**Spanish for Advanced Students P3** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+2	Z	v
04XSZ1	**Spanish for Beginners Z1** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+4	L	v
04XSZ2	**Spanish for Beginners Students Z2** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+4	Z	v
04XSZ3	**Spanish for Beginners Z3** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+4	L	v
04XSZ4	**Spanish for Beginners Z4** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+4	Z	v
04XSZ5	**Spanish for Beginners Z5** ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)*	Z	2	0+4	L	v

Characteristics of the courses of this group of Study Plan: Code=BSPJAZYKYZAP Name=BS P jazyky zap

04XAM1	English for Intermediate Students M1	Z	2

The course is designed for students who have successfully completed the full secondary school English language course at least at the A2 level of the Common European Framework of Reference for Languages (CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into fundamentals of vocabulary and style typical of professional oral and written communication situations. Thus it covers topics related to the student´s life and needs as well as topics of subtechnical interest. Attention is also paid to extending the knowledge of grammar issues used in EAP.

04XAM2	English for Intermediate Students M2	Z	2

The AM2 course expects the student to have completed the AM1 course. It develops their skills for work with subtechnical texts, focusing also more on specific grammar, functions, and lexical items typical of ESP and EAP (e.g., definition, existence and classification of phenomena, object descriptions). Part of the course is also guided writing. If necessary, grammar revision is included.

04XAM3	English for Intermediate Students M3	Z	2

The course develops the skills that enable students to cope with features typical of professional style. Increasing attention is paid to developing subtechnical vocabulary and independent understanding of professional texts. Great emphasis is placed on distinguishing different levels of formal and informal oral and written communication and their appropriate Czech equivalents. The course also includes studying abstracts and rules for writing them as well as basic rules for preparing and giving a short presentation on a chosen topic related to the student´s field.

04XAP1	English for Advanced Students P1	Z	2

The course is designed for students who have successfully completed the full secondary school English language course (at least the B1 level of the Common European Framework of Reference for Languages - CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into the fundamentals of vocabulary, functions, grammar, and style typical of professional oral and written communication situations (fundamentals of terms in mathematics and physics, definitions, graph descriptions, etc). It also covers professional oral and written communication on topics related to the undergraduate´s life and needs. It develops skills for free professional writing (writing a CV, letter of application, polite request). If necessary, revision of selected grammar topics is included.

04XAP2	English for Advanced Students P2	Z	2

The AP2 course is based on AP1, thus extending the student´s skills for working with subtechnical texts, and even with professional texts of chosen branches of science. According to the students´ needs it concentrates on chosen grammar topics, but mainly intends to develop understanding of syntactic structures and typical rhetorical functions (e.g., various types of descriptions, and, if possible, a case study). Increasing emphasis is placed on the undergraduate´s independent work with and reading of linguistically more demanding materials. The course extends the student´s subtechnical vocabulary, and includes fundamental notions of chosen branches of science. It is focused on formal writing including the sentence and paragraph structure, linking, cohesion and coherence in texts.

04XAP3	English for Advanced Students P3	Z	2

The AP3 course is based on AP2 and expects the student to work without any guidance with authentic professional materials and to interpret the text. It includes training oral and written communication skills and functions (e.g., expressing an opinion, agreement, and objections; taking part in discussion, note-taking; summarizing, writing an abstract) and, if possible, also preparing a project on a given or chosen topic and presenting it. The course places emphasis on distinguishing levels of formal and informal language both in oral and written communication.

04XCESZ1	Czech for Foreigners - Beginners 1	Z	2

The course is designed for students of the English programme. Students will become acquainted with the main characteristics of Czech (phonetic and grammar features) and they will acquire basic language and speaking skills. The course focuses on pronunciation exercises, simple social phrases, and oral and written communication in the most common everyday situations. The course covers roughly lessons 1-3 of Čeština Express (Czech Express) by L. Holá and P. Bořilová.

04XCESZ2	Czech for Foreigners - Beginners 2	Z	2

The language and communication competences acquired in CESZ1 are further developed. Students deepen their knowledge of the declension and conjugation system and practise basic communication topics. The course covers roughly lessons 3-5 in Czech Express by L. Holá and P. Bořilová.

04XCESZ3	Czech for Foreigners - Beginners 3	Z	2

The course further develops the language and communication competences acquired in the XCESZ1 and XCESZ2 courses. The teaching focuses on building up basic vocabulary, fixing correct pronunciation and deepening grammar, features through practice, as well as introducing the Czech culture. Students are asked to produce simple texts and they practise frequent types of dialogue. They also practise understanding texts in terms of main ideas or looking for specific details in texts. The course covers roughly lessons 5-7 in Čeština expres 1.

04XCESM1	Czech for Foreigners - Intermediate 1	Z	2

The course is focused on correct pronunciation, important morphological phenomena, prepositional phrases, and verb forms as well as on extending the student´s vocabulary for various social situations.

04XCESM2	Czech for Foreigners - Intermediate 2	Z	2

The course develops the topics covered in CESM1 and is then focused on more difficult grammar phenomena. It practices writing, speaking, and reading skills and trains the student in understanding common abbreviations, abbreviated words, and mathematical terms and formulas.

04XCESM3	Czech for Foreigners - Intermediate 3	Z	2

The last course revises morphological topics covered earlier and extends the student´s knowledge of more difficult language phenomena. It is especially focused on stylistics and lexicology and on developing the student´s writing skills.

04XCESP1	Czech for Foreign Students - Advanced 1	Z	2

The prerequisite of the course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common European Framework of Reference. It is focused partly on revision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of science. Students are taught the basics of functional style of engineering and professional communication, both in spoken and written form. The topics include University Studies and Student Life. Written practice includes communication with teachers and faculty administrators.

04XCESP2	Czech for Foreigners - Advanced 2	Z	2

This course extends the student´s knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical and specialist texts placing greater emphasis on individual work.

04XCESP3	Czech for Foreigners - Advanced 3	Z	2

The course develops the student´s knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation, and, finally, presentation of the student´s project. Writing skills necessary for professional communication are trained.

04XFM1	French for Intermediate Students M1	Z	2

French - intermediate FM The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and professional environment. They will be able to use the language to transmit general and technical information and to solve problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, systemizes and expands language skills gained in previous study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these texts.

04XFM2	French for Intermediate Students M2	Z	2
Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material.			
04XFM3	French for Intermediate Students M3	Z	2
The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students´ future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one´s own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence.			
04XFP1	French for Advanced Students P1	Z	2
FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-imparfait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topics of specialization: mathematics, internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation.			
04XFP2	French for Advanced Students P2	Z	2
With the link to P1 contents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication on given topics. Features typical of technical and scientific communication are stressed (passive voice, nominalization, word formation).			
04XFP3	French for Advanded Students P3	Z	2
The course is focused on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in engineering environment. Special skill - translation of shorter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covers a technical /applied science topic. It is a creative work compiled from 3 French sources. Preparation of several set topics for oral examination.			
04XFZ1	French for Beginners Z1	Z	2
French for beginners The objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life , in socializing and in professional life. The course includes French for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able to communicate at elementary level, actively using the knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdová, French for beginners (Francouzština pro začátečky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar.			
04XFZ2	French for Beginners Z2	Z	2
The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty.			
04XFZ3	French for Beginners Z3	Z	2
The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts.			
04XFZ4	French for Beginners Z4	Z	2
The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet.			
04XFZ5	French for Beginners Z5	Z	2
All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive.			
04XNM2	German for Intermediate Students M2	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNM1	German for Intermediate Students M1	Z	2
The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability.			
04XNM3	German for Intermediate Students M3	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNP1	German for Advanced Students P1	Z	2
This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning.			
04XNP2	German for Advanced Students P2	Z	2
The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech).			

04XNP3	German for Advanced Students P3	Z	2
The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German.			
04XRM1	Russian for Intermediate Students M1	Z	2
The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable.			
04XRM2	Russian for Intermediate Students M2	Z	2
The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable.			
04XRM3	Russian for Intermediate Students M3	Z	2
The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable.			
04XRP1	Russian for Advanced Students P1	Z	2
The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills.			
04XRP2	Russian for Advanced Students P2	Z	2
The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication.			
04XRP3	Russian for Advanced Students P3	Z	2
The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics.			
04XRZ1	Russian for Beginners Z1	Z	2
The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it.			
04XRZ2	Russian for Beginners Z2	Z	2
The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.			
04XRZ3	Russian for Beginners Z3	Z	2
The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking.			
04XRZ4	Russian for Beginners Z4	Z	2
The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals.			
04XRZ5	Russian for Beginners Z5	Z	2
The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.)			
04XSM1	Spanish for Intermediate Students M1	Z	2
The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them.			
04XSM2	Spanish for Intermediate Students M3	Z	2
The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet.			
04XSM3	Spanish for Intermediate Students M3	Z	2
The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination.			
04XSP1	Spanish for Advanced Students P1	Z	2
Course concentrates on more difficult grammar topics, revision of vocabulary, basics of Spanish for specific purposes as well as written communication. Course prerequisites: level B2 of CEFR.			
04XSP2	Spanish for Advanced Students P2	Z	2
Course XSP2 is the second part of the advanced Spanish course, extending Spanish for specific purposes topics. It comprises more grammar and syntax and focuses on independent written communication.			
04XSP3	Spanish for Advanced Students P3	Z	2
Course XSP3 is the final part of the advanced Spanish course. It is based on texts chosen by the students according to their future specialization. It is focused on written communication based on what students will need in their career.			

04XSZ1	Spanish for Beginners Z1	Z	2
Course XSZ1 is the first stage of the five-semester programme of Spanish studies; during the first stage the students will master phonetics and fundamental grammar structures and will be able to communicate at an elementary level on topics of everyday life. They will acquire and extend fundamental vocabulary of general Spanish and will develop it.			
04XSZ2	Spanish for Beginners Students Z2	Z	2
Course XSZ2 is based on course XSZ1, and expects students to develop and extend the knowledge and skills acquired so far. Grammar structures and lexis will be chosen so as to enable them to understand short adapted written texts and speech. Attention is also paid to cultural differences between Spanish-speaking countries and others such as the Czech Republic. Realia of Spanish-speaking countries are also included.			
04XSZ3	Spanish for Beginners Z3	Z	2
This course builds upon the foundations established in course XSZ2 and further develops students vocabulary and grammatical competence. It includes an introduction to the realia and cultural context of Spanish-speaking countries, with a primary focus on Spain. Particular attention is given to key grammatical structures, including the pretérito perfecto, pretérito indefinido, pretérito imperfecto, the gerund, and the imperative. The course also focuses on both written and spoken communication on general topics. Students are prepared for this through targeted reading and listening activities.			
04XSZ4	Spanish for Beginners Z4	Z	2
The course is based on course XSZ3. It develops the student´s vocabulary and extends the knowledge of the culture and social customs of the Spanish speaking countries, mainly of Spain. It pays attention to further grammar topics (perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given general or subtechnical topic, for which the student is trained by reading texts or listening to them.			
04XSZ5	Spanish for Beginners Z5	Z	2
The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with peculiarities of Spanish for specific purposes. In its final part, the general Spanish course based on the course book will end with a written and oral examination.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
00EKOT	Economy in Technology	Z	1
The course introduces the basics of micro- and macroeconomics.			
00ETV	Ethics of Science and Technology	Z	1
00MAM1	Essentials of High School Course 1	Z	1
Students are introduced to mathematical concepts and methods used in the introductory physics course.			
00MAM2	Essentials of High School Math Course 2	Z	1
Review of basics of high school mathematics.			
00PT	Preparatory Week	Z	2
00RET	Rhetoric	Z	1
The course is focused on the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the composition of public speech as well as to its nonverbal aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an integral part of the course.			
00UPRA	Introduction to Law	Z	1
00UPSY	Introduction to Psychology	Z	1
01ANB3	Calculus B 3	Z,ZK	8
1. Functional sequences and series - convergence range, criteria of uniform convergence, continuity, limit, differentiation and integration of functional series, power series, Series Expansion, Taylor´s theorem. 2. Ordinary differential equations - equations of first order (method of integration factor, equation of Bernoulli, separation of variables, homogeneous equation and exact equation) and equations of higher order (fundamental system, reduction of order, variation of parameters, equations with constant coefficients and special right-hand side, Euler differential equation). 3. Metric spaces - metric, norm, scalar product, neighborhood, interior and exterior points, boundary point, isolated and non-isolated point, boundary of set, completeness of space, Hilbert spaces. Orthogonal polynomials. Complete orthogonal systems. 4. Fourier series - expansion of functions into Fourier series, trigonometric Fourier series and their convergence. 5. Differential calculus of functions of several variables - limit, continuity, partial and directional derivative, gradient, total derivatives and tangent plane, Taylor series, elementary terms of vector analysis, Jacobi matrix. 6. Functions defined implicitly by one or several equations.			
01ANB4	Calculus B 4	Z,ZK	6
[1] Diferenciální počet funkcí více proměnných a funkcionálních vektorů. [2] Funkce zadané implicitně. [3] Taylorovy řady funkce více proměnných. [4] Regulární zobrazení, záměna proměnných, nekartézské soustavy souřadnic. [5] Lokální, vázané a globální extrémy funkce více proměnných. [6] Základy teorie míry a obrys konstrukce Lebesgueovy míry. [7] Integrální počet funkce více proměnných - Riemannův a Lebesgueův integrál, základní vlastnosti, Fubiniova věta, věta o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální věty.			
01BASE	Bachelor Seminar	Z	1
In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelors degree projects at the faculty. The second part is designed as a practical training for the defense of the bachelors degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the students performance.			
01BPAM1	Bachelor Thesis 1	Z	5
Bachelor's Degree project on the selected topic under the supervision. Supervision and regular checking of the bachalor project under preparation.			
01BPAM2	Bachelor Thesis 2	Z	10
Bachelor's Degree project on the selected topic under the supervision. Supervision and regular checking of the bachalor project under preparation.			
01CAS	Matematics for Particle Systems	Z,ZK	3
The aim of the course is to study general mathematical properties of one-dimensional stochastic particle systems whose elements are interacting. Especially, systems fulfilling a so-called balance property are analyzed. For such systems, statistical distributions of headways and multi-headways, interval frequencies, and associate statistical rigidity are examined.			
01DEM	History of Mathematics	Z	1
The subject has the form of regular seminars where the members of the department of mathematics, but also invited speakers - specialists in the field - give their talks on varoius topics from the history of mathematics.			
01DIM1	Discrete Mathematics 1	Z	2
The seminar is devoted to elementary number theory and applications. It includes individual problem solving.			

01DIM2	Discrete Mathematics 2	Z	2
	The seminar is devoted to recurrence relations. It includes individual problem solving.		
01DIMA3	Discrete Mathematics 3	ZK	2
	Students get to know problems and methods of their solving from various parts of discrete mathematics. The seminar includes individual problem solving of ones own choice from the given literature.		
01FANA1	Functional Analysis 1	Z,ZK	5
01FKO	Functions of Complex Variable	Z,ZK	3
	The course starts from outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable are explained in detail: the derivative of a complex function and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, Cauchy's integral theorem, Morera's theorem, roots of a holomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy estimates, Laurent series, residue theorem.		
01LAL	Linear Algebra 1	Z	2
	1. Vector space. 2. Linear dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6. Matrices of linear mappings. 7. Frobenius theorem.		
01LAL2	Linear Algebra 2	Z,ZK	4
	Outline: 1. Inverse matrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. Hermitian and quadratic forms. 5. Scalar product and orthogonality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of inverse matrices. 2. Methods of calculation of determinants. 3. Calculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and orthogonality. Calculation of orthogonal complements. 6. Geometry exercises and examples. 7. Adjoint operators.		
01LALZ	Linear Algebra 1, exam	ZK	2
01LIP	Linear Programming	Z,ZK	3
	We study special problems about constrained extremal problems for multivariable functions, where the function is linear and the constraints are given by linear equations and/or linear inequalities.		
01MAN	Calculus 1	Z	4
	Basic calculus (real analysis, functions of one real variable, differential calculus).		
01MAN2	Calculus 2	Z,ZK	8
	1. Continuation of differential calculus: Taylor´s Polynomials, Taylor´s formula 2. Infinite series: criteria of convergence, operations on series, absolute and conditional convergence 3. Real and complex power series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. Theory of integrals: primitives, definite integral (Riemann definition), techniques of integration and application of integrals, Generalized Riemann integral		
01MANZ	Calculus 1, exam	ZK	4
01MAPR	Markov processes	Z,ZK	4
01MAS	Mathematical Statistics	ZK	3
	The subject is devoted to usage of statistical methods studied in the course of Mathematical statistics. We deal with Fisher information matrix of statistical models, finding unbiased estimators with minimal variance, parameter estimation by method of moments and method of maximum likelihood, derivation of critical regions for hypothesis testing using the Neyman-Pearson lemma and likelihood ratio, confidence intervals and non-parametric density estimation.		
01MASC	Mathematical Statistics - Seminar	Z	2
	The subject is devoted to practical use of statistical methods studied in the course Mathematical Statistics 01MAS. The tutorial deals with calculation of Fisher information matrix of statistical models, finding unbiased estimators with minimal variance, parameter estimation by method of moments and method of maximum likelihood, derivation of critical regions for hypothesis testing using the Neyman-Pearson lemma and likelihood ratio, calculation of confidence intervals and non-parametric density estimation.		
01MIP	Measure and Probability	Z,ZK	6
	The subject is devoted to the introduction to Theory of probability on measure-theoretic level for discrete models, continuous distributions and general distributions of random variables. We deal with the examples of distributions including multi-dimensional Gaussian distribution and their properties. Further the (non)+integral characteristics of random variables (E, Var,...), convergence modes (Lp, P, a.s., D) and variants of limit theorems are derived (LLN, CLT).		
01NME2	Numerical Methods 2	KZ	2
	The course is devoted to numerical solution of boundary-value problems and intial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations.		
01PGR1	Computer Graphics 1	Z,ZK	2
	The first part of the two-semester "Computer Graphics" course is devoted to the specifics of digital display devices spanning from history up to the state of the art technologies. Further, a survey of fundamental problems in 2D computer graphics is given together with their solutions. Focus is put on mathematical description of problems and explanation of the corresponding algorithms using knowledge previously obtained in a variety of subjects available at FNSPE. The final part of the course covers the applications of computer graphics approaches in the process of authoring scientific documents and presentations.		
01PGR2	Computer Graphics 2	Z,ZK	2
	The second part of the two-semester "Computer Graphics" course begins with a brief introduction to signal theory in the context of aliasing - a phenomenon ubiquitous in computer graphics. Further, a well structured survey of fundamental problems in 3D computer graphics is given together with their solutions, from the description of a 3D scene to its realistic rendering. Focus is put on mathematical description of problems and explanation of the corresponding algorithms using knowledge previously obtained in a variety of subjects available at FNSPE. The algorithm implementation aspect such as data structures design etc. is also a matter of concern. In the last lecture, a number of theoretical concepts are demonstrated using Blender, an open-source 3D modeling and rendering software instrument.		
01PSL	LaTeX - Publication Instrument	Z	2
	The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX		
01PSR	Principles of Statistical Decision Making	ZK	2
	The subject is devoted to the statistical techniques for general decision procedures based on optimization of suitable stochastic criterion, their mutual comparisons with respect to their properties and applicability.		
01RMFB	Equations of Mathematical Physics B	Z,ZK	5
	The subject of this course is solving integral equations, theory of generalized functions, classification of partial differential equations, theory of integral transformations, and solution of partial differential equations.		
01SAM	Seminar of Applied Mathematics	Z	2
	1. Defectoscopy and acoustic emission. 2. Machine learning. 3. Traffic flow dynamics. Dynamics of crowd movement. 4. Digital image processing. 5. Dynamic pricing. 6. Statistical predictions in economics, sociology and psychology. 7. Application of random matrix theory.		
01SOS1	Software Seminar 1	Z	2
	Java, Java Beans, Assembly language programming for microprocessors Intel 80x86		

01SOS2	Software Seminar 2	Z	2
Graphical libraries GTK+ and Qt. Development of graphical user interface using C and C++ programming languages. Portable applications for Unix like operating systems, especially for Linux systems. Portability to Microsoft Windows.			
01SSM1	Seminar of Contemporary Mathematics 1	Z	2
This seminar provides a different approach to those fields of mathematics that are included in curriculum but also to those that are not part of basic courses of mathematics.			
01STME	Statistical Methods with Applications	ZK	2
The course consists of selected methods of statistical data analysis such as: linear regression and correlation, analysis of variance, nonparametric methods, contingency tables, and their application. The aim is to illustrate the use of statistical procedures on examples. Solutions of concrete examples by use of statistical software are also included.			
01TA	Algebra and Calculus in Applications	ZK	2
We illustrate methods based on combination of (CONtinuous) calculus and discrete (disCRETE) structures, so calles concrete mathematics. Theorems are motivated by problems from informatics and they are illustrated on problems from informatics.			
01UP1	Introduction to Probability 1	Z,ZK	3
1.Random trial with finite set of possible results, classical probability, independent random events 2.Probability and combinatorics 3.Probability and geometry, Bertrands paradox 4.Conditional probability, Bayes theorem, medical diagnosis, Simpsons paradox 5.Random variable with discrete state space, its distribution and mean value 6.Problems involving the calculation of mean value 7.Probabilistic method in graph theory 8.Random algorithms, Morris algorithm and its variants			
01UP2	Introduction to Probability 2	Z,ZK	3
1. One-dimensional continuous random variable and its statistical description. 2. Distribution function and probability density. 3. Axiomatic introduction of probability and connection to measure theory. 4. Numerical characteristics of continuous random variables. 5. Selected variants of continuous distributions and their characteristics. 6. Elementary methods for point estimations. 7. Generating pseudorandom numbers from the selected distribution.			
01USU	Introduction to Machine Learning	Z,ZK	4
The aim of this course is to provide a broad introduction to machine learning, data mining and statistical image recognition. Main attention is paid to the basic methods of learning with the teacher, cluster analysis and dimensionality reduction. The lectures and theory explanation is accompanied by examples of experiments and practical applications. Exercises use Python and run in computer labs with emphasis on the implementation and use of machine learning algorithms applied to real data from practical problems.			
02DEF1	History of Physics 1	Z	2
Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Physics in Helenistic period, Archimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kepler, Galileo, Huygens. The birth of physics as experimental science. Newton and his work.			
02DEF2	History of Physics 2	Z	2
Development of classical mechanics after Newton, Bernoulli's, Euler, Lagrange. Historical development of optics, corpuscular and wave approach. Electricity and magnetism - electrostatics, galvanism, electrodynamics and electromagnetism, Faraday and Maxwell. Thermodynamics and its laws, statistical physics, Boltzmann. The birth of modern quantum and relativistic physics, Planck and Einstein. Discovery of radioaktivity, structure of atom, atomic nucleus, Rutherford and Bohr. The way to nuclear energy, Elementary particles, standard model. The concept of Nature and Universe of today.			
02ELMA	Electricity and Magnetism	Z,ZK	6
Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamic forces, magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, RLC circuits. Electromagnetic waves, Maxwell equations.			
02FYS1	Physical Seminar 1	Z	2
The seminar is devoted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physics presented in the course of Mechanics. The problems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equipments.			
02MECH	Mechanics	Z	4
Introduction to physics, physical quantities and units. Kinematics of a particle, basic types of motion and their superposition. Dynamics of a particle, solving equations of motion for one-dimensional motion, motion in a central force field, forces in non-inertial reference frames. Mechanics of a system of particles, two-body problems, particle collisions. Mechanics of a rigid body, rotation.			
02MECHZ	Mechanics - Examination	ZK	2
The content of the subject is the examination according to the plan of studies.			
02TEF1	Theoretical Physics 1	Z,ZK	4
The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalisms as well as diferent approaches to description of dynamics (Newtons, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2).			
02TER	Heat and Molecular Physics	Z,ZK	4
Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution,equipartition theorem.			
02TSFA	Thermodynamics and Statistical Physics	Z,ZK	4
Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect,conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is usedto discusses simple transport phenomena.			
02UKP1	Introduction to Curves and Surfaces	Z	2
The goal of the lecture is an introduction to the differential geometry of simple manifolds - curves and two-dimensional surfaces. The basic concepts for the curves are introduced Frenets formulae are explained. In the surface theory we introduce first and second fundamental forms and mean and Gaussian curvature. Essential part of the lecture are the examples calculated by students.			
02VOAF	Waves, Optics and Atomic Physics	Z,ZK	6
Wave phenomena in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polarization, interference, diffraction, coherence. Geometrical optics. Introduction to quantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves,the Schrodinger equation, stationary states and spectra of finite systems.			
04AKS	English Conversation	Z	1
The course will develop the student´s communication skills acquired throughout their previous studies. It aims to improve all aspects of oral communication. The student will develop their vocabulary for various communication situations and will master their communication strategy. They will also practise their listening skills in order to better follow and participate in discussions. The student will be trained to express their ideas clearly and according to current English usage, and become a more confident speaker.			
04XAM1	English for Intermediate Students M1	Z	2
The course is designed for students who have successfully completed the full secondary school English language course at least at the A2 level of the Common European Framework of Reference for Languages (CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into fundamentals of vocabulary and style typical of			

	professional oral and written communication situations. Thus it covers topics related to the student´s life and needs as well as topics of subtechnical interest. Attention is also paid to extending the knowledge of grammar issues used in EAP.		
04XAM2	English for Intermediate Students M2	Z	2
	The AM2 course expects the student to have completed the AM1 course. It develops their skills for work with subtechnical texts, focusing also more on specific grammar, functions, and lexical items typical of ESP and EAP (e.g., definition, existence and classification of phenomena, object descriptions). Part of the course is also guided writing. If necessary, grammar revision is included.		
04XAM3	English for Intermediate Students M3	Z	2
	The course develops the skills that enable students to cope with features typical of professional style. Increasing attention is paid to developing subtechnical vocabulary and independent understanding of professional texts. Great emphasis is placed on distinguishing different levels of formal and informal oral and written communication and their appropriate Czech equivalents. The course also includes studying abstracts and rules for writing them as well as basic rules for preparing and giving a short presentation on a chosen topic related to the student´s field.		
04XAMZK	English for Intermediate Students Examination	ZK	4
	The course content is the examination as given by the study plan. The examination covers the AM1, AM2, and AM3 courses and consists of two parts - written (100 min) and oral (20-30 min). The student is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English courses.		
04XAP1	English for Advanced Students P1	Z	2
	The course is designed for students who have successfully completed the full secondary school English language course (at least the B1 level of the Common European Framework of Reference for Languages - CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into the fundamentals of vocabulary, functions, grammar, and style typical of professional oral and written communication situations (fundamentals of terms in mathematics and physics, definitions, graph descriptions, etc). It also covers professional oral and written communication on topics related to the undergraduate´s life and needs. It develops skills for free professional writing (writing a CV, letter of application, polite request). If necessary, revision of selected grammar topics is included.		
04XAP2	English for Advanced Students P2	Z	2
	The AP2 course is based on AP1, thus extending the student´s skills for working with subtechnical texts, and even with professional texts of chosen branches of science. According to the students´ needs it concentrates on chosen grammar topics, but mainly intends to develop understanding of syntactic structures and typical rhetorical functions (e.g., various types of descriptions, and, if possible, a case study). Increasing emphasis is placed on the undergraduate´s independent work with and reading of linguistically more demanding materials. The course extends the student´s subtechnical vocabulary, and includes fundamental notions of chosen branches of science. It is focused on formal writing including the sentence and paragraph structure, linking, cohesion and coherence in texts.		
04XAP3	English for Advanced Students P3	Z	2
	The AP3 course is based on AP2 and expects the student to work without any guidance with authentic professional materials and to interpret the text. It includes training oral and written communication skills and functions (e.g., expressing an opinion, agreement, and objections; taking part in discussion, note-taking; summarizing, writing an abstract) and, if possible, also preparing a project on a given or chosen topic and presenting it. The course places emphasis on distinguishing levels of formal and informal language both in oral and written communication.		
04XAPZK	English for Advanced Students Examination	ZK	4
	The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (100 min) and oral (30 min) and includes also oral presentation of a topic from the student´s field of study.		
04XCESM1	Czech for Foreigners - Intermediate 1	Z	2
	The course is focused on correct pronunciation, important morphological phenomena, prepositional phrases, and verb forms as well as on extending the student´s vocabulary for various social situations.		
04XCESM2	Czech for Foreigners - Intermediate 2	Z	2
	The course develops the topics covered in CESM1 and is then focused on more difficult grammar phenomena. It practices writing, speaking, and reading skills and trains the student in understanding common abbreviations, abbreviated words, and mathematical terms and formulas.		
04XCESM3	Czech for Foreigners - Intermediate 3	Z	2
	The last course revises morphological topics covered earlier and extends the student´s knowledge of more difficult language phenomena. It is especially focused on stylistics and lexicology and on developing the student´s writing skills.		
04XCESMZK	Czech for Intermediate Students Examination	ZK	4
	The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESM1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.		
04XCESP1	Czech for Foreign Students - Advanced 1	Z	2
	The prerequisite of the course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common European Framework of Reference. It is focused partly on revision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of science. Students are taught the basics of functional style of engineering and professional communication, both in spoken and written form. The topics include University Studies and Student Life. Written practice includes communication with teachers and faculty administrators.		
04XCESP2	Czech for Foreigners - Advanced 2	Z	2
	This course extends the student´s knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical and specialist texts placing greater emphasis on individual work.		
04XCESP3	Czech for Foreigners - Advanced 3	Z	2
	The course develops the student´s knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation, and, finally, presentation of the student´s project. Writing skills necessary for professional communication are trained.		
04XCESPZK	Czech for Foreign Students - Advanced Examination	ZK	4
	The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESP1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.		
04XCESZ1	Czech for Foreigners - Beginners 1	Z	2
	The course is designed for students of the English programme. Students will become acquainted with the main characteristics of Czech (phonetic and grammar features) and they will acquire basic language and speaking skills. The course focuses on pronunciation exercises, simple social phrases, and oral and written communication in the most common everyday situations. The course covers roughly lessons 1-3 of Čeština Express (Czech Express) by L. Holá and P. Bořilová.		
04XCESZ2	Czech for Foreigners - Beginners 2	Z	2
	The language and communication competences acquired in CESZ1 are further developed. Students deepen their knowledge of the declension and conjugation system and practise basic communication topics. The course covers roughly lessons 3-5 in Czech Express by L. Holá and P. Bořilová.		
04XCESZ3	Czech for Foreigners - Beginners 3	Z	2
	The course further develops the language and communication competences acquired in the XCESZ1 and XCESZ2 courses. The teaching focuses on building up basic vocabulary, fixing correct pronunciation and deepening grammar, features through practice, as well as introducing the Czech culture. Students are asked to produce simple texts and they practise frequent types of dialogue. They also practise understanding texts in terms of main ideas or looking for specific details in texts. The course covers roughly lessons 5-7 in Čeština expres 1.		

04XCESZZK	Czech for Foreigners Beginners - Examination	ZK	4
The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the 04XCESZ1,2,3 courses and can only be taken after successful completion of all three courses. Detailed information is to be obtained from the teacher.			
04XFM1	French for Intermediate Students M1	Z	2
French - intermediate FM The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and professional environment. They will be able to use the language to transmit general and technical information and to solve problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, systemizes and expands language skills gained in previous study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these texts.			
04XFM2	French for Intermediate Students M2	Z	2
Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material.			
04XFM3	French for Intermediate Students M3	Z	2
The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students´ future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one´s own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence.			
04XFMZK	French for Intermediate Students Examination	ZK	4
The content is the examination as given by the study programme. The whole French programme is ended with an examination covering the contents of FM1-FM3. The examination consists of a written and oral part and is organized according to Examination Instructions, a document available on the web.			
04XFP1	French for Advanced Students P1	Z	2
FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-imparfait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topics of specialization: mathematics, internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation.			
04XFP2	French for Advanced Students P2	Z	2
With the link to P1 contents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication on given topics. Features typical of technical and scientific communication are stressed (passive voice, nominalization, word formation).			
04XFP3	French for Advanded Students P3	Z	2
The course is focused on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in engineering environment. Special skill - translation of shorter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covers a technical /applied science topic. It is a creative work compiled from 3 French sources. Preparation of several set topics for oral examination.			
04XFPZK	French for Advanced Students Examination	ZK	4
The whole French program is ended with an examination covering the contents of FP1-FP3. The examination consists of a written and/or an oral part and is organized according to Examination Instructions, a document available on the web. Assessment of the presentation is included into the examination grading.			
04XFZ1	French for Beginners Z1	Z	2
French for beginners The objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life , in socializing and in professional life. The course includes French for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able to communicate at elementary level, actively using the knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdová, French for beginners (Francouzština pro začátečky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar.			
04XFZ2	French for Beginners Z2	Z	2
The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty.			
04XFZ3	French for Beginners Z3	Z	2
The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts.			
04XFZ4	French for Beginners Z4	Z	2
The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet.			
04XFZ5	French for Beginners Z5	Z	2
All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive.			
04XFZZK	French for Beginners Examination	ZK	3
The content is the examination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The examination is ruled by the document Instruction for examination. Its content covers the levels FZ1 - FZ5.			
04XNM1	German for Intermediate Students M1	Z	2
The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability.			

04XNM2	German for Intermediate Students M2	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNM3	German for Intermediate Students M3	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNMZK	German for Intermediate Students Examination	ZK	4
The course content is the examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 assessment. More detailed information is to be obtained from the teacher.			
04XNP1	German for Advanced Students P1	Z	2
This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning.			
04XNP2	German for Advanced Students P2	Z	2
The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech).			
04XNP3	German for Advanced Students P3	Z	2
The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German.			
04XNPZK	German for Advanced Students Examination	ZK	4
The course content is the examination as given by the study plan. The whole German for Advanced Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungraded assessment. More detailed information is to be obtained from the teacher.			
04XRM1	Russian for Intermediate Students M1	Z	2
The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable.			
04XRM2	Russian for Intermediate Students M2	Z	2
The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable.			
04XRM3	Russian for Intermediate Students M3	Z	2
The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable.			
04XRMZK	Russian for Intermediate Students Examination	ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher.			
04XRP1	Russian for Advanced Students P1	Z	2
The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills.			
04XRP2	Russian for Advanced Students P2	Z	2
The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication.			
04XRP3	Russian for Advanced Students P3	Z	2
The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics.			
04XRPZK	Russian for Advanced Students Examination	ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher.			
04XRZ1	Russian for Beginners Z1	Z	2
The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it.			
04XRZ2	Russian for Beginners Z2	Z	2
The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.			

04XRZ3	Russian for Beginners Z3	Z	2
The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking.			
04XRZ4	Russian for Beginners Z4	Z	2
The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals.			
04XRZ5	Russian for Beginners Z5	Z	2
The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.)			
04XRZZK	Russian for Beginners Examination	ZK	3
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RZ1 - RZ5. Students are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instructions by the teacher.			
04XSM1	Spanish for Intermediate Students M1	Z	2
The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them.			
04XSM2	Spanish for Intermediate Students M3	Z	2
The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet.			
04XSM3	Spanish for Intermediate Students M3	Z	2
The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination.			
04XSMZK	Spanish for Intermediate Students Examination	ZK	4
The course content is the examination as given by the study plan. XSMZK examination consists of two parts: written and oral; to be eligible for the written part, students will have obtained non-graded assessment for course XSM3. Oral examination follows the written part.			
04XSP1	Spanish for Advanced Students P1	Z	2
Course concentrates on more difficult grammar topics, revision of vocabulary, basics of Spanish for specific purposes as well as written communication. Course prerequisites: level B2 of CEFR.			
04XSP2	Spanish for Advanced Students P2	Z	2
Course XSP2 is the second part of the advanced Spanish course, extending Spanish for specific purposes topics. It comprises more grammar and syntax and focuses on independent written communication.			
04XSP3	Spanish for Advanced Students P3	Z	2
Course XSP3 is the final part of the advanced Spanish course. It is based on texts chosen by the students according to their future specialization. It is focused on written communication based on what students will need in their career.			
04XSPZK	Spanish for Advanced Students Examination	ZK	4
The course content is the examination as given by the study plan. Examination XSPZK consists of two parts, namely oral and written. The prerequisite for admission to oral part is having passed the written test. Examination content is based on syllabi of courses XSP1, XSP2, and XSP3 or on an individual study plan of the student.			
04XSZ1	Spanish for Beginners Z1	Z	2
Course XSZ1 is the first stage of the five-semester programme of Spanish studies; during the first stage the students will master phonetics and fundamental grammar structures and will be able to communicate at an elementary level on topics of everyday life. They will acquire and extend fundamental vocabulary of general Spanish and will develop it.			
04XSZ2	Spanish for Beginners Students Z2	Z	2
Course XSZ2 is based on course XSZ1, and expects students to develop and extend the knowledge and skills acquired so far. Grammar structures and lexis will be chosen so as to enable them to understand short adapted written texts and speech. Attention is also paid to cultural differences between Spanish-speaking countries and others such as the Czech Republic. Realia of Spanish-speaking countries are also included.			
04XSZ3	Spanish for Beginners Z3	Z	2
This course builds upon the foundations established in course XSZ2 and further develops students vocabulary and grammatical competence. It includes an introduction to the realia and cultural context of Spanish-speaking countries, with a primary focus on Spain. Particular attention is given to key grammatical structures, including the pretérito perfecto, pretérito indefinido, pretérito imperfecto, the gerund, and the imperative. The course also focuses on both written and spoken communication on general topics. Students are prepared for this through targeted reading and listening activities.			
04XSZ4	Spanish for Beginners Z4	Z	2
The course is based on course XSZ3. It develops the student´s vocabulary and extends the knowledge of the culture and social customs of the Spanish speaking countries, mainly of Spain. It pays attention to further grammar topics (perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given general or subtechnical topic, for which the student is trained by reading texts or listening to them.			
04XSZ5	Spanish for Beginners Z5	Z	2
The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with peculiarities of Spanish for specific purposes. In its final part, the general Spanish course based on the course book will end with a written and oral examination.			
04XSZZK	Spanish for Beginners Examination	ZK	3
The course content is the examination as given by the study plan. Examination consists of two parts - written and oral. Student can register for oral examination only if he/she has passed the written examination test.			
12ANM	Applied Numerical Methods	KZ	4
For English version use code 12YNME1. There are explained the basic principles of numerical mathematics important for numerical solving of problems important for physics and technology. Methods for solution of tasks very important for physicists (ordinary differential equations, random numbers) are included in addition to the basic numerical methods. Integrated computational environment MATLAB is used as a demonstration tool. The seminars are held in computer laboratory and PASCAL is used as a principle programming language and MATLAB is also used.			

12PYTH	Scientific Programming in Python	Z	2
The aim of this course is to learn the fundamentals of the modern Python programming language with a focus on scientific computing. Emphasis is placed on effective solutions to real problems. The course is performed in an interactive form of practical exercises, whose topics can be tailored to the content of other subjects or student theses. Students are also involved in ongoing research. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented or functional programming. The greater part of the course focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciPy and the Matplotlib graphics library. We show how to generate efficient code, how to combine Python with other languages, what tools are available.			
12UNXAP	Introduction to UNIX	Z	2
Computer and operating systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interface. Hardware and software. Principles of operating systems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working with files. Text editors: vi, emacs. Command interpreter (shell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard tools. Graphical user interface X-windows. Computer networks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications			
12UVP	Introduction to Scientific Computing	Z	2
Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom.Students get acquinted with some basic tools fort scientific and technicval computing, data analysis, data visualisation and algorithm development.			
14TED	Creating Electronic Documents	Z	2
Basic skills for creating and presenting student theses. Individual exercises focus on creating and formatting texts, equations, charts, tables, presentations and entire documents in an office suite.			
15CH1	General Chemistry 1	Z	3
The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises.			
15CH2	General Chemistry 2	Z,ZK	3
The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises.			
17UING	Introduction to Engineering	KZ	3
This course provides introduction to engineering skills. Students should gain general engineering skills at basic level (e.g. material properties and behavior, basics of manufacturing and production, quality assurance, environmental impacts,). In addition, the introduction to scientific work and technical drawing will be included.			
18NES1	Neural Networks 1	KZ	5
The aim of the course "Neural Networks 1" is to acquaint students with basic models of artificial neural networks, algorithms for their learning, and other related machine learning techniques. The goal is to teach students how to apply these models and methods to solve practical tasks.			
18NES2	Neural Networks 2	KZ	3
The aim of the course "Neural Networks 2" is to acquaint students with basic models of deep neural networks and teach them how to apply these models and methods to solve practical tasks.			
18PMTL	Programming in MATLAB	KZ	4
Introducing Matlab environment as efficient tool for computation in complex arrays and symbolic variables, namely for linear algebra, mathematic analysis, statistics, algorithmization and geometric representation of results.			
18PPY1	Programming in Python 1	Z	2
This course introduces students to advanced features of the Python language and common scientific packages. The course covers both object-oriented as well as functional programming paradigms. The following part of the course describes the use of Python in the fields of scientific and technical computing (NumPy and SciPy packages), data processing and visualization.			
18PPY2	Programming in Python 2	Z	2
This course introduces students to practical applications of the Python language in scientific as well as commercial fields. The course is a seminar where each presented topic is accompanied by a short demo of a real-world application in the specific field.			
18PPY3	Programming in Python 3	Z	2
This advanced course is intended for students who have basic experience with programming in Python and using its libraries. It introduces students to advanced concepts of the Python language and modules they are based on.			
18PRC1	Programming in C++ 1	Z	4
This course covers mainly the C programming language and non-object oriented features of the C++ language.			
18PRC2	Programming in C++ 2	KZ	4
This course covers the object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Template Library.			
18UQI	Introduction to quantum informatics	Z	3
Quantum information has been on the rise for years. In this course, we explore the basics of quantum information theory with a strong emphasis on quantum computing. We discuss some of the most important quantum principles that lead to the so called quantum advantage and discuss many important quantum algorithms with the requisite amount of theoretical underpinning.			
18ZALG	Basics of Algorithmization	Z,ZK	4
This course is devoted to selected algorithms and methods for algorithm design. This course intruduces selected methods for the determination of the algorithm complexity.			
18ZPRO	Basics of Programming	Z	4
This course is intended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in programming and with the Python programming language.			
B0B36JUL	Julia for optimization and learning	KZ	4
Julia programming language is increasingly known by the community for its suitability in the field of numerical calculations. The course consists of two parts. The first part presents the basics of Julia. The second part introduces mathematical optimization and its application in machine learning, statistics and optimal control of differential equations. While the first part shows the individual concepts of Julia, the second part combines them into longer logical sections of code. We explain each application theoretically. Students are encouraged both to write simple functions by themselves and compare them with already existing packages. The course ends with a final project. Students can either choose a topic connected to their theses or join a Kaggle competition with real data. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
TV-1	Physical Education	Z	1
TV-2	Physical Education	Z	1
TV-3	Physical education	Z	1
TV-4	Physical education	Z	1