

Study plan

Name of study plan: Aplikace informatiky v přírodních vědách

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Applications of Informatics in Natural Sciences

Type of study: Bachelor full-time

Required credits: 0

Elective courses credits: 180

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: BSPAIPV1

Name of the group: BS P_AIPVB 1st year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 17 courses

Credits in the group: 0

Note on the group: Podmínkou skládání zkoušky 01MANZ je získání zápočtu z 01MAN.Podmínkou skládání zkoušky 01LALZ je získání zápočtu z 01LAL.

| 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 |
|--------|---|------------|---------|-------|----------|------|
| 02DEF1 | History of Physics 1 Igor Jex Igor Jex (Gar.) | Z | 2 | 2+0 | Z | P |
| 01DIM1 | Discrete Mathematics 1 Edita Pelantová, Zuzana Masáková, Lubomíra Dvořáková Lubomíra Dvořáková Zuzana Masáková (Gar.) | Z | 2 | 2P+0C | Z | P |
| 01DIM2 | Discrete Mathematics 2 Edita Pelantová, Zuzana Masáková Zuzana Masáková Zuzana Masáková (Gar.) | Z | 2 | 2P+0C | L | P |
| 01LAL | Linear Algebra 1 Lubomíra Dvořáková, Petr Ambrož Lubomíra Dvořáková Lubomíra Dvořáková (Gar.) | Z | 2 | 2P+2C | | P |
| 01LALZ | Linear Algebra 1, exam Lubomíra Dvořáková, Petr Ambrož Lubomíra Dvořáková Lubomíra Dvořáková (Gar.) | ZK | 2 | 0P+0C | | P |
| 01LAL2 | Linear Algebra 2 Lubomíra Dvořáková, Petr Ambrož Lubomíra Dvořáková Lubomíra Dvořáková (Gar.) | Z,ZK | 4 | 2P+2C | | P |
| 18MAK1 | Macroeconomics 1 Quang Van Tran Quang Van Tran Quang Van Tran (Gar.) | Z,ZK | 4 | 2+2 | L | P |
| 01MAN | Calculus 1 Edita Pelantová, Pavel Strachota, Miroslav Kolář Pavel Strachota Pavel Strachota (Gar.) | Z | 4 | 4+4 | | P |
| 01MANZ | Calculus 1, exam Edita Pelantová, Pavel Strachota, Miroslav Kolář Pavel Strachota Pavel Strachota (Gar.) | ZK | 4 | 0P+0C | | P |
| 01MAN2 | Calculus 2 Edita Pelantová, Miroslav Kolář, Maksym Dreval Edita Pelantová Maksym Dreval (Gar.) | Z,ZK | 8 | 4P+4C | | P |
| 18MIK | Microeconomics Quang Van Tran Quang Van Tran Quang Van Tran (Gar.) | Z,ZK | 4 | 2P+2C | Z | P |
| 18PPY1 | Programming in Python 1 Matej Mojžeš, Jakub Klinkovský Jakub Klinkovský Jakub Klinkovský (Gar.) | Z | 2 | 2C | L | P |
| 00PT | Preparatory Week Petr Ambrož, Milan Krbálek Petr Ambrož Petr Ambrož (Gar.) | Z | 2 | týden | Z | P |
| 18OS | Operating Systems Administration Vladimír Jarý Vladimír Jarý Vladimír Jarý (Gar.) | KZ | 2 | 0+2 | L | P |

| | | | | | | |
|---------|---|------|---|-------|---|---|
| 12UNXAP | Introduction to UNIX <i>Milan Kucha ík Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z | 2 | 1P+1C | L | P |
| 18ZALG | Basics of Algorithmization <i>Vladimír Jarý, Jan Tomsa, Petr Pauš, František Vold ich, Miroslav Virius, František Gašpar, Zuzana Pet í ková Vladimír Jarý Miroslav Virius (Gar.)</i> | Z,ZK | 4 | 2+2 | L | P |
| 18ZPRO | Basics of Programming <i>Maksym Dreval, Jakub Klinkovský, Vladimír Jarý, Jan Tomsa, Petr Pauš, František Vold ich, Miroslav Virius, Zuzana Pet í ková, Nichita Vatamaniuc, Miroslav Virius Miroslav Virius (Gar.)</i> | Z | 4 | 4C | Z | P |

Characteristics of the courses of this group of Study Plan: Code=BSPAIPV1 Name=BS P_AIPVB 1st year

| | | | |
|---------|--|------|---|
| 02DEF1 | History of Physics 1 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 Hellenistic 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. | Z | 2 |
| 01DIM1 | Discrete Mathematics 1 The seminar is devoted to elementary number theory and applications. It includes individual problem solving. | Z | 2 |
| 01DIM2 | Discrete Mathematics 2 The seminar is devoted to recurrence relations. It includes individual problem solving. | Z | 2 |
| 01LAL | Linear Algebra 1 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. | Z | 2 |
| 01LALZ | Linear Algebra 1, exam | ZK | 2 |
| 01LAL2 | Linear Algebra 2 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. | Z,ZK | 4 |
| 18MAK1 | Macroeconomics 1 Macroeconomics I provides students with a fundamental theoretical basis for understanding how an economy works. It introduces main macroeconomic indicators, money market, macroeconomic equilibrium theory, fundamentals of open economy theory, inflation, unemployment, economic growth, economic fluctuations, basic macroeconomic models of IS-LM, AS-AD and their implications for economic policies. The learning outcomes of the course is to equip students with ability to analyze macroeconomic phenomena and their interconnections and subsequently to use them under the conditions of modern economic life. | Z,ZK | 4 |
| 01MAN | Calculus 1 Basic calculus (real analysis, functions of one real variable, differential calculus). | Z | 4 |
| 01MANZ | Calculus 1, exam | ZK | 4 |
| 01MAN2 | Calculus 2 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 | Z,ZK | 8 |
| 18MIK | Microeconomics Microeconomics is a set of theories, which help us to understand processes by which the scarce resources are allocated among alternative uses. Microeconomics explains the role of prices and markets in these processes and makes more clear behaviour of the economic agents. Lectures and seminars are designed so that the explanation of microeconomic concepts does not require knowledge of calculus. | Z,ZK | 4 |
| 18PPY1 | Programming in Python 1 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. | Z | 2 |
| 00PT | Preparatory Week | Z | 2 |
| 18OS | Operating Systems Administration Administration of operating systems Windows and Linux. Users, rights, configuration, command line, networks, firewall | KZ | 2 |
| 12UNXAP | Introduction to UNIX 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 attributes, 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 configuration of a computer. Network services: hardware sharing, mail, scp, etc. Network applications | Z | 2 |
| 18ZALG | Basics of Algorithmization This course is devoted to selected algorithms and methods for algorithm design. This course intruduces selected methods for the determination of the algorithm complexity. | Z,ZK | 4 |
| 18ZPRO | Basics of Programming 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. | Z | 4 |

Code of the group: BSPAIPV2

Name of the group: BS P_AIPVB 2nd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 11 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) <i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|---------|----------|------|
| 02FY1 | Physics 1 <i>Jaroslav Bielík Jaroslav Bielík Jaroslav Bielík (Gar.)</i> | Z,ZK | 4 | 2P+2C | Z | P |
| 02FY2 | Physics 2 <i>Jaroslav Bielík Jaroslav Bielík Jaroslav Bielík (Gar.)</i> | Z,ZK | 4 | 2P+2C | L | P |
| 18MAK2 | Macroeconomics 2 <i>Quang Van Tran Quang Van Tran Quang Van Tran (Gar.)</i> | Z,ZK | 4 | 2+2 | Z | P |
| 01ANB3 | Calculus B 3 <i>Miroslav Kolář, Milan Krbálek Milan Krbálek Miroslav Kolář (Gar.)</i> | Z,ZK | 8 | 4P+4C | | P |
| 01ANB4 | Calculus B 4 <i>Jiří Mikyška, Miroslav Kolář Jiří Mikyška Milan Krbálek (Gar.)</i> | Z,ZK | 6 | 2P+4C | | P |
| 12NME1 | Numerical Methods 1 <i>Pavel Váchal Pavel Váchal Pavel Váchal (Gar.)</i> | Z,ZK | 4 | 2+2 | L | P |
| 18PRC1 | Programming in C++ 1 <i>Vladimír Jarý, Miroslav Virius Miroslav Virius Miroslav Virius (Gar.)</i> | Z | 4 | 2+2 | Z | P |
| 18PRC2 | Programming in C++ 2 <i>Jakub Klinkovský, Vladimír Jarý, Miroslav Virius Miroslav Virius Miroslav Virius (Gar.)</i> | KZ | 4 | 2+2 | L | P |
| 18PMTL | Programming in MATLAB <i>Quang Van Tran, Matěj Pokorný, Jaromír Kukal Quang Van Tran Jaromír Kukal (Gar.)</i> | KZ | 4 | 4C | Z | P |
| 01PSL | LaTeX - Publication Instrument <i>Petr Ambrož Petr Ambrož Petr Ambrož (Gar.)</i> | Z | 2 | 0+2 | L | P |
| 18GUI | Construction of Graphical user interface <i>Vladimír Jarý Vladimír Jarý Vladimír Jarý (Gar.)</i> | Z | 2 | 0P + 2C | L | P |

Characteristics of the courses of this group of Study Plan: Code=BSPAIPV2 Name=BS P_AIPVB 2nd year

| | | | |
|---|--|------|---|
| 02FY1 | Physics 1 | Z,ZK | 4 |
| History, principles and applications of mechanics, waves and thermodynamics ? basic level. The lecture is supplemented with practical investigation and demonstration of selected physical phenomena. | | | |
| 02FY2 | Physics 2 | Z,ZK | 4 |
| Thermodynamics, electricity and magnetism, modern physics. The lecture is supplemented with practical investigation and demonstration of selected physical phenomena. | | | |
| 18MAK2 | Macroeconomics 2 | Z,ZK | 4 |
| Macroeconomics II extends theoretical knowledge acquired from Macroeconomics I of its students with the latest knowledge of contemporary macroeconomics. They are models of economic growth, especially those with an emphasis on the role of human capital and technological progress. Furthermore, it introduces students to modern principles of economic modeling, i.e., macroeconomic models derived from microeconomic behavior of subjects and economics and their rational expectations. It also provides students with modern knowledge of labor market modeling. | | | |
| 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 funkce 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 extrém funkce více proměnných. [6] Základy teorie míry a obrysy konstrukce Lebesgueovy míry. [7] Integrální počet funkce více proměnných - Riemannův a Lebesgueův integrál, základní vlastnosti, Fubiniho věta, věta o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální věty. | | | |
| 12NME1 | Numerical Methods 1 | Z,ZK | 4 |
| 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 principle programming language as a demonstration tool. The seminars are held in computer laboratory. | | | |
| 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 other advanced constructs in the C++; programming language and the Standard Template Library. | | | |
| 18PMTL | Programming in MATLAB | KZ | 4 |
| Introducing Matlab environment as efficient tool for computation in complex arrays and symbolic variables, namely for linear algebra, mathematical analysis, statistics, algorithmization and geometric representation of results. | | | |
| 01PSL | LaTeX - Publication Instrument | Z | 2 |
| The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX | | | |
| 18GUI | Construction of Graphical user interface | Z | 2 |
| The course introduces to the graphical user interface, its design and creation. Practical problems and their solutions will be demonstrated in the exercises. Students will learn to create simple RAD applications | | | |

Code of the group: BSPAIPV3

Name of the group: BS P_AIPVB 3rd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 16 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) <i>Tutors, authors and guarantors (Gar.)</i> | Completion | Credits | Scope | Semester | Role |
|---------|--|------------|---------|-------|----------|------|
| 18AOV | Applied operational research <i>Quang Van Tran, Adam Borovi ka Quang Van Tran Quang Van Tran (Gar.)</i> | Z,ZK | 4 | 2P+2C | L | P |
| 18BPSE1 | Bachelor Thesis 1 <i>Milan Kucha ík, Radek Fu ík, Dana Majerová Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z | 5 | 0+5 | Z | P |
| 18BPSE2 | Bachelor Thesis 2 <i>Milan Kucha ík, Radek Fu ík, Dana Majerová Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z | 10 | 0+10 | L | P |
| 18EKN | Econometrics <i>Quang Van Tran, Radek H ebík Quang Van Tran Quang Van Tran (Gar.)</i> | Z,ZK | 4 | 2P+2C | L | P |
| 01LIP | Linear Programming <i>Jan Volec Jan Volec Jan Volec (Gar.)</i> | Z,ZK | 3 | 2+1 | Z | P |
| 01PGR1 | Computer Graphics 1 <i>Pavel Strachota Pavel Strachota Pavel Strachota (Gar.)</i> | Z,ZK | 2 | 1P+1C | | P |
| 01PGR2 | Computer Graphics 2 <i>Pavel Strachota Pavel Strachota Pavel Strachota (Gar.)</i> | Z,ZK | 2 | 1P+1C | | P |
| 01PRST | Probability and Statistics <i>Tomáš Hobza Tomáš Hobza Tomáš Hobza (Gar.)</i> | Z,ZK | 4 | 3+1 | Z | P |
| 18PJ | Programming in Java <i>Miroslav Virius Miroslav Virius Miroslav Virius (Gar.)</i> | Z,ZK | 5 | 2P+2C | Z | P |
| 18PW | Web environment and markup languages <i>Pavel Eichler Dana Majerová Dana Majerová (Gar.)</i> | KZ | 2 | 2C | Z | P |
| 18SBAK | Bachelor Seminar <i>Quang Van Tran, Milan Kucha ík, Jaromír Kuka, Dana Majerová Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z | 2 | 0+2 | L | P |
| 01TKO | Theory of Codes <i>Edita Pelantová, Jan Volec Edita Pelantová Jan Volec (Gar.)</i> | ZK | 2 | 2P+0C | L | P |
| 18INTA | Development of internet applications <i>Jakub Klinkovský, Dana Majerová Dana Majerová Dana Majerová (Gar.)</i> | KZ | 4 | 2P+2C | L | P |
| 12UPF1 | Introduction to Computational Physics 1 <i>Milan Kucha ík, Richard Liska Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z,ZK | 2 | 1P+1C | Z | P |
| 12UPF2 | Introduction to Computational Physics 2 <i>Milan Kucha ík, Richard Liska Milan Kucha ík Milan Kucha ík (Gar.)</i> | Z,ZK | 2 | 1P+1C | L | P |
| 12ZMDT | Measurement and Data Processing <i>Ivan Procházka, Josef Blažej Josef Blažej Ivan Procházka (Gar.)</i> | Z,ZK | 2 | 1P+1C | Z | P |

Characteristics of the courses of this group of Study Plan: Code=BSPAIPV3 Name=BS P_AIPVB 3rd year

| | | | |
|---|------------------------------|------|----|
| 18AOV | Applied operational research | Z,ZK | 4 |
| The course is an introduction course to selected models and methods for economic decision making. The main attention is given to the introduction to the methods and possibilities of their real applications and problem solving by means of the current software products. | | | |
| 18BPSE1 | Bachelor Thesis 1 | Z | 5 |
| The bachelor project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. | | | |
| 18BPSE2 | Bachelor Thesis 2 | Z | 10 |
| The bachelor project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. | | | |
| 18EKN | Econometrics | Z,ZK | 4 |
| Econometrics is based on economic theory and the relations between economic quantities are expressed by mathematical tools and observed data from economic reality. The course covers basic instruments of econometric analysis as the basic econometric model, the generalized model, the system of simultaneous equations and instruments for econometric model verification. | | | |
| 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. | | | |
| 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. | | | |

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|---|---|------|---|
| 01PRST | Probability and Statistics | Z,ZK | 4 |
| It is a basic course of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolmogorov definition. The notions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and proved. On the basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained. | | | |
| 18PJ | Programming in Java | Z,ZK | 5 |
| This course is devoted to the Java platform and to the development of the basic types of applications for this platform. | | | |
| 18PW | Web environment and markup languages | KZ | 2 |
| The course introduces students to fundamental principles and best practices for web design with respect to technical functionality, informational value, readability and usability. | | | |
| 18SBAK | Bachelor Seminar | Z | 2 |
| Seminar devoted to preparation of the bachelor's thesis and the presentation of the result. Students present their running results. | | | |
| 01TKO | Theory of Codes | ZK | 2 |
| Algebraic methods used in error detecting and error correcting codes. | | | |
| 18INTA | Development of internet applications | KZ | 4 |
| The lectures provide an overview of modern technologies for the development of web applications. Students will learn basic web languages and concepts (HTML, URL, etc.) and they will also be introduced to relational database systems. The tutorials are dedicated to practical examples of building web applications, from the simplest to more advanced. The course is oriented primarily towards backend technologies and using the Python languages, but covers also frontend frameworks and JavaScript. | | | |
| 12UPF1 | Introduction to Computational Physics 1 | Z,ZK | 2 |
| Numerical simulation and its role in physics, methodology of writing computer codes. Computer languages for physics. Numerical libraries and program libraries for physics. Computer tools for scientific visualization. Computational fluid dynamics, hydrodynamic simulations, methods for discretization of Euler equations. High-performance computing, parallel computing, software for parallel simulations. Databases of scientific information, scientist evaluation, citation analysis. | | | |
| 12UPF2 | Introduction to Computational Physics 2 | Z,ZK | 2 |
| Nonlinear models, complex systems, chaotic systems, fractals and their applications in physics. Artificial intelligence methods: neural networks, machine learning, genetic algorithms, expert systems and their applications in physics. Quantum computing. Virtual reality. | | | |
| 12ZMDT | Measurement and Data Processing | Z,ZK | 2 |
| Basic knowledge for the measurements and data processing and result interpretation: errors, precision, accuracy, normal distribution and its properties, data fitting, separation of the signal from the noise. | | | |

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 0

The role of the block: PV

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) <i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 00EKOT | Economy in Technology <i>Jana Ková ová</i> | Z | 1 | 2+0 | | PV |
| 00ETV | Ethics of Science and Technology <i>Jakub Háj ek Jana Ková ová</i> | Z | 1 | 0+2 | L | PV |
| 00RET | Rhetoric <i>Jana Ková ová Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 1 | 0+2 | | PV |
| 00UPRA | Introduction to Law <i>Martin ech Jana Ková ová</i> | Z | 1 | 0+2 | | PV |
| 00UPSY | Introduction to Psychology <i>Jakub Háj ek Jana Ková ová</i> | Z | 1 | 0+2 | | PV |

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

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|---|----------------------------------|---|---|
| 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 pronunciation. 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) <i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|-----------|--|------------|---------|-------|----------|------|
| 04XAMZK | English for Intermediate Students Examination <i>Jana Ková ová, Slav na Brownová Jana Ková ová</i> | ZK | 4 | | Z | PV |
| 04XAPZK | English for Advanced Students Examination <i>Slav na Brownová, Darren Copeland Jana Ková ová</i> | ZK | 4 | | Z | PV |
| 04XCESZZK | Czech for Foreigners Beginners - Examination <i>Slav na Brownová Jana Ková ová Jana Ková ová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XCESMZK | Czech for Intermediate Students Examination <i>Jana Ková ová Jana Ková ová Jana Ková ová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XCESPZK | Czech for Foreign Students - Advanced Examination <i>Jana Ková ová Jana Ková ová Jana Ková ová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XFMZK | French for Intermediate Students Examination <i>V ra Šlechtová V ra Šlechtová V ra Šlechtová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XFPZK | French for Advanced Students Examination <i>V ra Šlechtová V ra Šlechtová V ra Šlechtová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XFZZK | French for Beginners Examination <i>V ra Šlechtová V ra Šlechtová V ra Šlechtová (Gar.)</i> | ZK | 3 | | L | PV |
| 04XNMZK | German for Intermediate Students Examination <i>Miloslava echová Miloslava echová Miloslava echová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XNPZK | German for Advanced Students Examination <i>Miloslava echová Miloslava echová Miloslava echová (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XRMZK | Russian for Intermediate Students Examination <i>Zhanna Isaeva Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XRPZK | Russian for Advanced Students Examination <i>Zhanna Isaeva Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XRZZK | Russian for Beginners Examination <i>Zhanna Isaeva Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | ZK | 3 | | L | PV |
| 04XSMZK | Spanish for Intermediate Students Examination <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XSPZK | Spanish for Advanced Students Examination <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | ZK | 4 | | Z | PV |
| 04XSZZK | Spanish for Beginners Examination <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | ZK | 3 | | L | PV |

Characteristics of the courses of this group of Study Plan: Code=BSPJAZYKYKZK 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. SMZK examination consists of two parts - written and oral; to be eligible for the written part, students will have obtained non-graded assessment for course SM3. 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 SPZK 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 SP1, SP2, and SP3 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: BSPAIPVV

Name of the group: BS P_AIPVB 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) <i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|---------|--|------------|---------|-------|----------|------|
| 12AUX | Administration of UNIX System <i>Milan Ši or Milan Ši or Milan Ši or (Gar.)</i> | KZ | 2 | 2+0 | L | v |
| 18AAIO | Applications of AI for image processing <i>Petr Kubera Petr Kubera Petr Kubera (Gar.)</i> | KZ | 3 | 5XD | | v |
| 02DEF2 | History of Physics 2 <i>Igor Jex Miroslav Myška Igor Jex (Gar.)</i> | Z | 2 | 2+0 | L | v |
| 01DIMA3 | Discrete Mathematics 3 <i>Lubomíra Dvo áková Lubomíra Dvo áková Lubomíra Dvo áková (Gar.)</i> | ZK | 2 | 2P+0C | | v |
| 11GNU | GNU Programming <i>Martin Dráb Martin Dráb Martin Dráb (Gar.)</i> | KZ | 4 | 2P+2C | L | v |
| 01JEPR | Simple Compilers <i>Zden k ulík Zden k ulík Zden k ulík (Gar.)</i> | Z | 2 | 2 | L | v |
| 04AKS | English Conversation <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 1 | 0+2 | L | v |
| 00MAM1 | Essentials of High School Course 1 <i>David B e</i> | Z | 1 | 0+1 | | v |
| 00MAM2 | Essentials of High School Math Course 2 <i>Lukáš Heriban Severín Pošta Lukáš Heriban (Gar.)</i> | Z | 1 | 0+1 | | v |
| 18NES1 | Neural Networks 1 <i>Zuzana Pet í ková Zuzana Pet í ková</i> | KZ | 5 | 2P+2C | L | v |
| 18NES2 | Neural Networks 2 <i>František Vold ich, Zuzana Pet í ková Zuzana Pet í ková Zuzana Pet í ková (Gar.)</i> | KZ | 3 | 0P+2C | L | v |
| 01SITE1 | Computer Networks 1 <i>Miroslav Minárik Miroslav Minárik Miroslav Minárik (Gar.)</i> | Z | 2 | 1+1 | Z | v |
| 01SITE2 | Computer Networks 2 <i>Miroslav Minárik Miroslav Minárik Miroslav Minárik (Gar.)</i> | Z | 2 | 1+1 | L | v |
| 18PROP | Practical training in programming <i>Jakub Klinkovský Jakub Klinkovský Jakub Klinkovský (Gar.)</i> | KZ | 3 | 2C | Z | v |
| 01PERI | Programming of Peripherals Devices <i>Zden k ulík Zden k ulík (Gar.)</i> | Z | 2 | 2+0 | Z | v |
| 18PVP | Programming in Pascal <i>Miroslav Virius Miroslav Virius Miroslav Virius (Gar.)</i> | Z,ZK | 4 | 2+2 | L | v |
| 18PPY2 | Programming in Python 2 <i>Jakub Klinkovský Jakub Klinkovský Jakub Klinkovský (Gar.)</i> | Z | 2 | 2S | Z | v |
| 18PPY3 | Programming in Python 3 <i>Rudolf Pecinovský Jakub Klinkovský Jakub Klinkovský (Gar.)</i> | Z | 2 | 2C | L | v |

| | | | | | | |
|---------|--|------|---|-------|---|---|
| 18SVK | Student's Scientific Conference <i>Kate ina Horaisová Kate ina Horaisová Kate ina Horaisová (Gar.)</i> | Z | 1 | 5 dní | | 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 |
| 14TED | Creating Electronic Documents <i>Aleš Materna, Ji í Martin ík Aleš Materna Aleš Materna (Gar.)</i> | Z | 2 | 26C | | v |
| 18UDB | Introduction to Databases <i>Dana Majerová Dana Majerová Dana Majerová (Gar.)</i> | Z | 2 | 1P+1C | Z | v |
| 17UING | Introduction to Engineering <i>Jan Frýbort, Petr Haušild, Radek Mušálek Jan Frýbort (Gar.)</i> | KZ | 3 | 2P+1C | Z | v |
| 18UQI | Introduction to quantum informatics <i>Aleš Wodecki Aleš Wodecki (Gar.)</i> | Z | 3 | 2P | L | v |
| 18UOA | Introduction into Object Oriented Architecture <i>Rudolf Pecinovský Rudolf Pecinovský</i> | Z,ZK | 4 | 2P+2C | Z | v |
| 01UOP | Introduction to Object Programming <i>Zden k ulík Zden k ulík Zden k ulík (Gar.)</i> | ZK | 2 | 0+2 | | v |
| 01UP1 | Introduction to Probability 1 <i>Jan Vybíral Jan Vybíral Jan Vybíral (Gar.)</i> | Z,ZK | 3 | 1P+1C | | v |
| 01UP2 | Introduction to Probability 2 <i>Milan Krbálek, Michaela Krbáková Michaela Krbáková Milan Krbálek (Gar.)</i> | Z,ZK | 3 | 1P+1C | | v |
| 01USU | Introduction to Machine Learning <i>Ji í Franc, Jan Flusser Ji í Franc Jan Flusser (Gar.)</i> | Z,ZK | 4 | 2P+2C | | v |
| 12PYTH | Scientific Programming in Python <i>Pavel Váchal, Jakub Urban Pavel Váchal Pavel Váchal (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 18CLOUD | Virtualization and cloud technologies <i>Jakub Klinkovský Jakub Klinkovský Jakub Klinkovský (Gar.)</i> | KZ | 3 | 1P+1C | L | v |

Characteristics of the courses of this group of Study Plan: Code=BSPAIPVV Name=BS P_AIPVB Optional courses

| | | | |
|---|---|----|---|
| 12AUX | Administration of UNIX System | KZ | 2 |
| Basic and more advanced administration of Unix operating system | | | |
| 18AAIO | Applications of AI for image processing | KZ | 3 |
| 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 radioactivity, 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. | | | |
| 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. | | | |
| 11GNU | GNU Programming | KZ | 4 |
| The aim of the course is to introduce students into the Linux system environment and therein used GNU utilities and programming tools to such a level, that they would be able to use these tools for creating scripts and programs for processing acquired or simulated data for their experiments in physics with the use of the facultys Hyperion cluster (however the learned skills could of course be applied to any Linux system). | | | |
| 01JEPR | Simple Compilers | Z | 2 |
| Lexical and syntax analysis, code generation, simple optimizations, development environments, reflection. | | | |
| 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. | | | |
| 01SITE1 | Computer Networks 1 | Z | 2 |
| Understanding the history and present network (LAN, WAN, use the principles and technologies). Architecture of reference model ISO/OSI. Network protocols, practical exercises with TCP/IP communications. Internet services - mail, remote access, www. Secure communication, tunneling. Directory services, certificates, certification authorities, public key infrastructure (PKI). Use in practice. Network security - firewalls (packet filters, proxies, gateways, NAT, DMZ), practical exercises. (According to the interest - the serial control lines, modems) | | | |
| 01SITE2 | Computer Networks 2 | Z | 2 |
| Understanding the history and present network (LAN, WAN, use the principles and technologies). Architecture of reference model ISO/OSI. Network protocols, practical exercises with TCP/IP communications. Internet services - mail, remote access, www. Secure communication, tunneling. Directory services, certificates, certification authorities, public key infrastructure (PKI). Use in practice. Network security - firewalls (packet filters, proxies, gateways, NAT, DMZ), practical exercises. (According to the interest - the serial control lines, modems) | | | |

| | | | |
|---------|---|------|---|
| 18PROP | Practical training in programming The goal of this course is to understand advanced topics related to programming, code design and software project development. Students will practice pragmatic techniques and principles on concrete real-world examples. Emphasis is put on the review of freely available software tools that can improve the programmers work efficiency and ensure high quality of the final source code. | KZ | 3 |
| 01PERI | Programming of Peripherals Devices Memory organization, input and output ports, computer bus. Software libraries for computer peripherals, 3D graphic libraries. Principles of peripherals device drivers. | Z | 2 |
| 18PVP | Programming in Pascal This lecture 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 Pascal programming language. | Z,ZK | 4 |
| 18PPY2 | Programming in Python 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. | Z | 2 |
| 18PPY3 | Programming in Python 3 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. | Z | 2 |
| 18SVK | Student's Scientific Conference This is the active participation of the student in one of the approved student conferences. The list of such conferences is defined by the course guarantor. | Z | 1 |
| TV-1 | Physical Education | Z | 1 |
| TV-2 | Physical Education | Z | 1 |
| TV-3 | Physical education | Z | 1 |
| TV-4 | Physical education | Z | 1 |
| 14TED | Creating Electronic Documents 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. | Z | 2 |
| 18UDB | Introduction to Databases This course is an introduction to relational database systems. Students will learn basic concepts and how to design a relational database. Students will be able to work with data using SQL. Credit is awarded for the seminar work (ERA model of relational database and its implementation in SQL). | Z | 2 |
| 17UING | Introduction to Engineering 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. | KZ | 3 |
| 18UQI | Introduction to quantum informatics 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. | Z | 3 |
| 18UOA | Introduction into Object Oriented Architecture | Z,ZK | 4 |
| 01UOP | Introduction to Object Programming Object oriented programming languages. Object oriented programming libraries for graphics, databases and distributed systems. | ZK | 2 |
| 01UP1 | Introduction to Probability 1 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 | Z,ZK | 3 |
| 01UP2 | Introduction to Probability 2 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. | Z,ZK | 3 |
| 01USU | Introduction to Machine Learning 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. | Z,ZK | 4 |
| 12PYTH | Scientific Programming in Python 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. | Z | 2 |
| 18CLOUD | Virtualization and cloud technologies The goal of this course is to introduce the principles and technological foundations of cloud systems. Students will be introduced to the architectures of distributed systems, principles of application virtualization and they will learn how to use these technologies in practice. A fundamental part of the course is using containers, which is currently the most efficient technology for managing complex software systems. The practical part of the course covers tools for automatic configuration, testing, monitoring and deployment of virtualized applications. | KZ | 3 |

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) <i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|----------|--|------------|---------|-------|----------|------|
| 04XAM1 | English for Intermediate Students M1 <i>Jana Ková ová</i> | Z | 2 | 0+2 | Z | v |
| 04XAM2 | English for Intermediate Students M2 <i>Jana Ková ová</i> | Z | 2 | 0+2 | L | v |
| 04XAM3 | English for Intermediate Students M3 <i>Jana Ková ová</i> | Z | 2 | 0+2 | Z | v |
| 04XAP1 | English for Advanced Students P1 <i>Jana Ková ová</i> | Z | 2 | 0+2 | Z | v |
| 04XAP2 | English for Advanced Students P2 <i>Jana Ková ová</i> | Z | 2 | 0+2 | L | v |
| 04XAP3 | English for Advanced Students P3 <i>Jana Ková ová</i> | Z | 2 | 0+2 | Z | v |
| 04XCESZ1 | Czech for Foreigners - Beginners 1 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XCESZ2 | Czech for Foreigners - Beginners 2 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XCESZ3 | Czech for Foreigners - Beginners 3 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 2S | Z | v |
| 04XCESM1 | Czech for Foreigners - Intermediate 1 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XCESM2 | Czech for Foreigners - Intermediate 2 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XCESM3 | Czech for Foreigners - Intermediate 3 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XCESP1 | Czech for Foreign Students - Advanced 1 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XCESP2 | Czech for Foreigners - Advanced 2 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XCESP3 | Czech for Foreigners - Advanced 3 <i>Jana Ková ová Jana Ková ová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XFM1 | French for Intermediate Students M1 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XFM2 | French for Intermediate Students M2 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XFM3 | French for Intermediate Students M3 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XFP1 | French for Advanced Students P1 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XFP2 | French for Advanced Students P2 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XFP3 | French for Advanced Students P3 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XFZ1 | French for Beginners Z1 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XFZ2 | French for Beginners Z2 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XFZ3 | French for Beginners Z3 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XFZ4 | French for Beginners Z4 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XFZ5 | French for Beginners Z5 <i>V ra Šlechtová V ra Šlechtová (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XNM2 | German for Intermediate Students M2 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XNM1 | German for Intermediate Students M1 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XNM3 | German for Intermediate Students M3 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XNP1 | German for Advanced Students P1 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XNP2 | German for Advanced Students P2 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XNP3 | German for Advanced Students P3 <i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XRM1 | Russian for Intermediate Students M1 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XRM2 | Russian for Intermediate Students M2 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XRM3 | Russian for Intermediate Students M3 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XRP1 | Russian for Advanced Students P1 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | Z | v |

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| 04XRP2 | Russian for Advanced Students P2 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XRP3 | Russian for Advanced Students P3 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XRZ1 | Russian for Beginners Z1 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XRZ2 | Russian for Beginners Z2 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XRZ3 | Russian for Beginners Z3 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XRZ4 | Russian for Beginners Z4 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XRZ5 | Russian for Beginners Z5 <i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XSM1 | Spanish for Intermediate Students M1 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XSM2 | Spanish for Intermediate Students M3 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XSM3 | Spanish for Intermediate Students M3 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XSP1 | Spanish for Advanced Students P1 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XSP2 | Spanish for Advanced Students P2 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XSP3 | Spanish for Advanced Students P3 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | Z | v |
| 04XSZ1 | Spanish for Beginners Z1 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XSZ2 | Spanish for Beginners Students Z2 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XSZ3 | Spanish for Beginners Z3 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+4 | L | v |
| 04XSZ4 | Spanish for Beginners Z4 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+4 | Z | v |
| 04XSZ5 | Spanish for Beginners Z5 <i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+4 | L | v |

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

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| 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 eština Express (Czech Express) by L. Holá and P. Bo ilová. | | | |

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| 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 CEM1 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: subjunctif, 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 Advanced 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 začátečníky). 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 builds 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. | | | |

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| 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. | | | |

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| 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 SP2 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 SP3 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 SZ1 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 SZ2 is based on course SZ1, 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 |
| The course is based on course SZ2, and develops the student's vocabulary and grammar structure. The course covers realia (history and culture) of the Spanish-speaking countries, mainly of Spain. It pays attention to further grammar topics (pretérito perfecto, pretérito indefinido, pretérito imperfecto, the gerund and the imperative). It includes written and oral communication on a given general topic, for which the student is trained by reading texts or listening to them. | | | |
| 04XSZ4 | Spanish for Beginners Z4 | Z | 2 |
| The course is based on course SZ3. 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 presentations and, finally, a written and oral examination. | | | |

List of courses of this pass:

| Code | Name of the course | Completion | Credits |
|--------|---|------------|---------|
| 00EKOT | Economy in Technology The course introduces the basics of micro- and macroeconomics. | Z | 1 |
| 00ETV | Ethics of Science and Technology | Z | 1 |
| 00MAM1 | Essentials of High School Course 1 Students are introduced to mathematical concepts and methods used in the introductory physics course. | Z | 1 |
| 00MAM2 | Essentials of High School Math Course 2 Review of basics of high school mathematics. | Z | 1 |
| 00PT | Preparatory Week | Z | 2 |

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| 00RET | Rhetoric | Z | 1 |
| The course is focused on the acquisition of speech and voice techniques and on the rules of correct pronunciation. 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 souadnic. [5] Lokální, vázané a globální extrémů funkce více proměnných. [6] Základy teorie míry a obrysy konstrukce Lebesgueovy míry. [7] Integrální počet funkcí více proměnných - Riemannův a Lebesgueův integrál, základní vlastnosti, Fubiniho věta, věta o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální věty. | | | |
| 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 one's own choice from the given literature. | | | |
| 01JEPR | Simple Compilers | Z | 2 |
| Lexical and syntax analysis, code generation, simple optimizations, development environments, reflection. | | | |
| 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 |
| 01PERI | Programming of Peripherals Devices | Z | 2 |
| Memory organization, input and output ports, computer bus. Software libraries for computer peripherals, 3D graphic libraries. Principles of peripherals device drivers. | | | |
| 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. | | | |
| 01PRST | Probability and Statistics | Z,ZK | 4 |
| It is a basic course of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolmogorov definition. The notions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and proved. On the basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained. | | | |
| 01PSL | LaTeX - Publication Instrument | Z | 2 |
| The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX | | | |
| 01SITE1 | Computer Networks 1 | Z | 2 |
| Understanding the history and present network (LAN, WAN, use the principles and technologies). Architecture of reference model ISO/OSI. Network protocols, practical exercises with TCP/IP communications. Internet services - mail, remote access, www. Secure communication, tunneling. Directory services, certificates, certification authorities, public key infrastructure (PKI). Use in practice. Network security - firewalls (packet filters, proxies, gateways, NAT, DMZ), practical exercises. (According to the interest - the serial control lines, modems) | | | |

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| 01SITE2 | Computer Networks 2 | Z | 2 |
| Understanding the history and present network (LAN, WAN, use the principles and technologies). Architecture of reference model ISO/OSI. Network protocols, practical exercises with TCP/IP communications. Internet services - mail, remote access, www. Secure communication, tunneling. Directory services, certificates, certification authorities, public key infrastructure (PKI). Use in practice. Network security - firewalls (packet filters, proxies, gateways, NAT, DMZ), practical exercises. (According to the interest - the serial control lines, modems) | | | |
| 01TKO | Theory of Codes | ZK | 2 |
| Algebraic methods used in error detecting and error correcting codes. | | | |
| 01UOP | Introduction to Object Programming | ZK | 2 |
| Object oriented programming languages. Object oriented programming libraries for graphics, databases and distributed systems. | | | |
| 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 Hellenistic 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 radioactivity, 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. | | | |
| 02FY1 | Physics 1 | Z,ZK | 4 |
| History, principles and applications of mechanics, waves and thermodynamics ? basic level. The lecture is supplemented with practical investigation and demonstration of selected physical phenomena. | | | |
| 02FY2 | Physics 2 | Z,ZK | 4 |
| Thermodynamics, electricity and magnetism, modern physics. The lecture is supplemented with practical investigation and demonstration of selected physical phenomena. | | | |
| 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. | | | |

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| 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 eština Express (Czech Express) by L. Holá and P. Bo ilová. | | | |
| 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. Bo ilová. | | | |
| 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 eština 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: subjunctif, 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). | | | |

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| 04XFP3 | French for Advanced 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 začátečnický). 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 builds 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. | | | |

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| 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. SMZK examination consists of two parts - written and oral; to be eligible for the written part, students will have obtained non-graded assessment for course SM3. Oral examination follows the written part. | | | |

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| 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 SP2 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 SP3 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 SPZK 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 SP1, SP2, and SP3 or on an individual study plan of the student. | | | |
| 04XSZ1 | Spanish for Beginners Z1 | Z | 2 |
| Course SZ1 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 SZ2 is based on course SZ1, 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 |
| The course is based on course SZ2, and develops the student's vocabulary and grammar structure. The course covers realia (history and culture) of the Spanish-speaking countries, mainly of Spain. It pays attention to further grammar topics (pretérito perfecto, pretérito indefinido, pretérito imperfecto, the gerund and the imperative). It includes written and oral communication on a given general topic, for which the student is trained by reading texts or listening to them. | | | |
| 04XSZ4 | Spanish for Beginners Z4 | Z | 2 |
| The course is based on course SZ3. 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 presentations and, finally, 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. | | | |
| 11GNU | GNU Programming | KZ | 4 |
| The aim of the course is to introduce students into the Linux system environment and therein used GNU utilities and programming tools to such a level, that they would be able to use these tools for creating scripts and programs for processing acquired or simulated data for their experiments in physics with the use of the facultys Hyperion cluster (however the learned skills could of course be applied to any Linux system). | | | |
| 12AUX | Administration of UNIX System | KZ | 2 |
| Basic and more advanced administration of Unix operating system | | | |
| 12NME1 | Numerical Methods 1 | Z,ZK | 4 |
| 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 principle programming language as a demonstration tool. The seminars are held in computer laboratory. | | | |
| 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 attributes, 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 configuration of a computer. Network services: hardware sharing, mail, scp, etc. Network applications | | | |
| 12UPF1 | Introduction to Computational Physics 1 | Z,ZK | 2 |
| Numerical simulation and its role in physics, methodology of writing computer codes. Computer languages for physics. Numerical libraries and program libraries for physics. Computer tools for scientific visualization. Computational fluid dynamics, hydrodynamic simulations, methods for discretization of Euler equations. High-performance computing, parallel computing, software for parallel simulations. Databases of scientific information, scientist evaluation, citation analysis. | | | |
| 12UPF2 | Introduction to Computational Physics 2 | Z,ZK | 2 |
| Nonlinear models, complex systems, chaotic systems, fractals and their applications in physics. Artificial intelligence methods: neural networks, machine learning, genetic algorithms, expert systems and their applications in physics. Quantum computing. Virtual reality. | | | |
| 12ZMDT | Measurement and Data Processing | Z,ZK | 2 |
| Basic knowledge for the measurements and data processing and result interpretation: errors, precision, accuracy, normal distribution and its properties, data fitting, separation of the signal from the noise. | | | |
| 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. | | | |

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| 18AAIO | Applications of AI for image processing | KZ | 3 |
| 18AOV | Applied operational research | Z,ZK | 4 |
| The course is an introduction course to selected models and methods for economic decision making. The main attention is given to the introduction to the methods and possibilities of their real applications and problem solving by means of the current software products. | | | |
| 18BPSE1 | Bachelor Thesis 1 | Z | 5 |
| The bachelor project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. | | | |
| 18BPSE2 | Bachelor Thesis 2 | Z | 10 |
| The bachelor project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. | | | |
| 18CLOUD | Virtualization and cloud technologies | KZ | 3 |
| The goal of this course is to introduce the principles and technological foundations of cloud systems. Students will be introduced to the architectures of distributed systems, principles of application virtualization and they will learn how to use these technologies in practice. A fundamental part of the course is using containers, which is currently the most efficient technology for managing complex software systems. The practical part of the course covers tools for automatic configuration, testing, monitoring and deployment of virtualized applications. | | | |
| 18EKN | Econometrics | Z,ZK | 4 |
| Econometrics is based on economic theory and the relations between economic quantities are expressed by mathematical tools and observed data from economic reality. The course covers basic instruments of econometric analysis as the basic econometric model, the generalized model, the system of simultaneous equations and instruments for econometric model verification. | | | |
| 18GUI | Construction og Grafical user interface | Z | 2 |
| The course introduces to the graphical user interface, its design and creation. Practical problems and their solutions will be demonstrated in the exercises. Students will learn to create simple RAD applications | | | |
| 18INTA | Development of internet applications | KZ | 4 |
| The lectures provide an overview of modern technologies for the development of web applications. Students will learn basic web languages and concepts (HTML, URL, etc.) and they will also be introduced to relational database systems. The tutorials are dedicated to practical examples of building web applications, from the simplest to more advanced. The course is oriented primarily towards backend technologies and using the Python languages, but covers also frontend frameworks and JavaScript. | | | |
| 18MAK1 | Macroeconomics 1 | Z,ZK | 4 |
| Macroeconomics I provides students with a fundamental theoretical basis for understanding how an economy works. It introduces main macroeconomic indicators, money market, macroeconomic equilibrium theory, fundamentals of open economy theory, inflation, unemployment, economic growth, economic fluctuations, basic macroeconomic models of IS-LM, AS-AD and their implications for economic policies. The learning outcomes of the course is to equip students with ability to analyze macroeconomic phenomena and their interconnections and subsequently to use them under the conditions of modern economic life. | | | |
| 18MAK2 | Macroeconomics 2 | Z,ZK | 4 |
| Macroeconomics II extends theoretical knowledge acquired from Macroeconomics I of its students with the latest knowledge of contemporary macroeconomics. They are models of economic growth, especially those with an emphasis on the role of human capital and technological progress. Furthermore, it introduces students to modern principles of economic modeling, i.e., macroeconomic models derived from microeconomic behavior of subjects and economics and their rational expectations. It also provides students with modern knowledge of labor market modeling. | | | |
| 18MIK | Microeconomics | Z,ZK | 4 |
| Microeconomics is a set of theories, which help us to understand processes by which the scarce resources are allocated among alternative uses. Microeconomics explains the role of prices and markets in these processes and makes more clear behaviour of the economic agents. Lectures and seminars are designed so that the explanation of microeconomic concepts does not require knowledge of calculus. | | | |
| 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. | | | |
| 18OS | Operating Systems Administration | KZ | 2 |
| Administration of operating systems Windows and Linux. Users, rights, configuration, command line, networks, firewall | | | |
| 18PJ | Programming in Java | Z,ZK | 5 |
| This course is devoted to the Java platform and to the development of the basic types of applications for this platform. | | | |
| 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. | | | |
| 18PROP | Practical training in programming | KZ | 3 |
| The goal of this course is to understand advanced topics related to programming, code design and software project development. Students will practice pragmatic techniques and principles on concrete real-world examples. Emphasis is put on the review of freely available software tools that can improve the programmers work efficiency and ensure high quality of the final source code. | | | |

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| 18PVP | Programming in Pascal This lecture 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 Pascal programming language. | Z,ZK | 4 |
| 18PW | Web environment and markup languages The course introduces students to fundamental principles and best practices for web design with respect to technical functionality, informational value, readability and usability. | KZ | 2 |
| 18SBAK | Bachelor Seminar Seminar devoted to preparation of the bachelor's thesis and the presentation of the result. Students present their running results. | Z | 2 |
| 18SVK | Student's Scientific Conference This is the active participation of the student in one of the approved student conferences. The list of such conferences is defined by the course guarantor. | Z | 1 |
| 18UDB | Introduction to Databases This course is an introduction to relational database systems. Students will learn basic concepts and how to design a relational database. Students will be able to work with data using SQL. Credit is awarded for the seminar work (ERA model of relational database and its implementation in SQL). | Z | 2 |
| 18UOA | Introduction into Object Oriented Architecture | Z,ZK | 4 |
| 18UQI | Introduction to quantum informatics 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. | Z | 3 |
| 18ZALG | Basics of Algorithmization This course is devoted to selected algorithms and methods for algorithm design. This course introduces selected methods for the determination of the algorithm complexity. | Z,ZK | 4 |
| 18ZPRO | Basics of Programming 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. | Z | 4 |
| TV-1 | Physical Education | Z | 1 |
| TV-2 | Physical Education | Z | 1 |
| TV-3 | Physical education | Z | 1 |
| TV-4 | Physical education | Z | 1 |

For updated information see <http://bilakniha.cvut.cz/en/FF.html>

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