

# Study plan

## Name of study plan: Fyzikální inženýrství - Fyzikální inženýrství materiál

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Physical Engineering

Type of study: Bachelor full-time

Required credits: 6

Elective courses credits: 174

Sum of credits in the plan: 180

Note on the plan:

Name of the block: Povinné předměty specializace

Minimal number of credits of the block: 0

The role of the block: PS

Code of the group: BSPFIFIM1

Name of the group: BS P\_FIB FIM 1st year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 14 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<br>(in case of groups of courses the list of codes of their members)<br>Tutors, authors and guarantors (gar.)  | Completion | Credits | Scope | Semester | Role |
|---------|--|------------|---------|-------|----------|------|
| 02DEF1  | <b>History of Physics 1</b><br>Igor Jex, Miroslav Myška <b>Miroslav Myška</b> Igor Jex (Gar.)  | Z          | 2       | 2+0   | Z        | PS   |
| 02ELMA  | <b>Electricity and Magnetism</b><br>Iskender Yalcinkaya, Goce Chadzitaskos, Josef Schmidt, Jan Vysoký <b>Jan Vysoký</b> Goce Chadzitaskos (Gar.)   | Z,ZK       | 6       | 4+2   | L        | PS   |
| 01LAL   | <b>Linear Algebra 1</b><br>Petr Ambrož, Lubomíra Dvořáková <b>Lubomíra Dvořáková</b> Lubomíra Dvořáková (Gar.)   | Z          | 2       | 2P+2C |          | PS   |
| 01LALZ  | <b>Linear Algebra 1, exam</b><br>Petr Ambrož, Lubomíra Dvořáková <b>Lubomíra Dvořáková</b> Lubomíra Dvořáková (Gar.)   | ZK         | 2       | 0P+0C |          | PS   |
| 01LAL2  | <b>Linear Algebra 2</b><br>Petr Ambrož, Lubomíra Dvořáková <b>Lubomíra Dvořáková</b> Lubomíra Dvořáková (Gar.)   | Z,ZK       | 4       | 2P+2C |          | PS   |
| 01MAN   | <b>Calculus 1</b><br>Miroslav Kolář, Pavel Strachota, Edita Pelantová <b>Pavel Strachota</b> Edita Pelantová (Gar.)  | Z          | 4       | 4+4   |          | PS   |
| 01MANZ  | <b>Calculus 1, exam</b><br>Miroslav Kolář, Pavel Strachota, Edita Pelantová <b>Pavel Strachota</b> Pavel Strachota (Gar.)  | ZK         | 4       | 0P+0C |          | PS   |
| 01MAN2  | <b>Calculus 2</b><br>Severin Pošta, Miroslav Kolář, Edita Pelantová <b>Miroslav Kolář</b> Severin Pošta (Gar.)   | Z,ZK       | 8       | 4P+4C |          | PS   |
| 02MECH  | <b>Mechanics</b><br>Iskender Yalcinkaya, David Bělohradský <b>Michal Jex</b> David Bělohradský (Gar.)  | Z          | 4       | 4+2   | Z        | PS   |
| 02MECHZ | <b>Mechanics - Examination</b><br>Iskender Yalcinkaya, Goce Chadzitaskos, David Bělohradský, Filip Petrásek, Stanislav Skoupý, Antonín Hoskovec, Petr Novotný <b>Antonín Hoskovec</b> David Bělohradský (Gar.) | ZK         | 2       | -     | Z        | PS   |
| 00PT    | <b>Preparatory Week</b><br>Petr Ambrož, Milan Krbálek <b>Petr Ambrož</b> Petr Ambrož (Gar.)  | Z          | 2       | týden | Z        | PS   |
| 02TER   | <b>Heat and Molecular Physics</b><br>Filip Petrásek <b>Petr Novotný</b> Petr Jizba (Gar.)  | Z,ZK       | 4       | 2+2   | L        | PS   |
| 17UING  | <b>Introduction to Engineering</b><br>Jan Frýbort, Petr Haušild, Radek Mušálek Jan Frýbort (Gar.)  | KZ         | 3       | 2P+1C | Z        | PS   |

|        |   |   |   |    |   |    |
|--------|---|---|---|----|---|----|
| 18ZPRO | <b>Basics of Programming</b><br><i>Maksym Dreval, Vladimír Jary, Miroslav Virius, Jakub Klinkovský, Petr Pauš, František Voldich, Jan Tomsa, Zuzana Petříková</i> <b>Miroslav Virius</b> Miroslav Virius (Gar.) | Z | 4 | 4C | Z | PS |
|--------|---|---|---|----|---|----|

**Characteristics of the courses of this group of Study Plan: Code=BSPFIFIM1 Name=BS P\_FIB FIM 1st year**

|         |  |      |   |
|---------|--|------|---|
| 02DEF1  | History of Physics 1<br>Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orient and Greece, Greek natural philosophers, Aristotle. Physics in Hellenistic period, Archimedes. 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 |
| 02ELMA  | Electricity and Magnetism<br>Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamics, magnetic field. Magnetic dipole, magnetism. Electromagnetic induction, AC currents. Electromagnetic waves, Maxwell equations   | Z,ZK | 6 |
| 01LAL   | Linear Algebra 1<br>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<br>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 |
| 01MAN   | Calculus 1<br>Basic calculus (real analysis, functions of one real variable, differential calculus).   | Z    | 4 |
| 01MANZ  | Calculus 1, exam   | ZK   | 4 |
| 01MAN2  | Calculus 2<br>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 |
| 02MECH  | Mechanics<br>Introduction to physics, physical quantities and units. Particle kinematics, basic types of motion and their superposition. Particle dynamics, one-dimensional equations of motion, motion in central force field, forces in non-inertial reference frames. Mechanics of system of free particles, two-body problem, collisions. Mechanics of rigid body, rotation. Fundamentals of continuum mechanics, elasticity, hydrodynamics. Sound.  | Z    | 4 |
| 02MECHZ | Mechanics - Examination<br>The content of the subject is the examination according to the plan of studies.   | ZK   | 2 |
| 00PT    | Preparatory Week   | Z    | 2 |
| 02TER   | Heat and Molecular Physics<br>Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution, equipartition theorem.  | Z,ZK | 4 |
| 17UING  | Introduction to Engineering<br>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 |
| 18ZPRO  | Basics of Programming<br>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: BSPFIFIM2

Name of the group: BS P\_FIB FIM 2nd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 9 courses

Credits in the group: 0

Note on the group: Předmět 02TEF1 lze absolvovat až po absolvování předmětu 02MECHZ.

| Code   | Name of the course / Name of the group of courses<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 14DYLS | <b>Dynamics of Linear Systems</b><br><i>Jiří Kunz Jiří Kunz Jiří Kunz (Gar.)</i>   | Z,ZK       | 2       | 1P+1C | 6        | PS   |
| 14ELM  | <b>Electron Microscopy</b><br><i>Miroslav Karlík Miroslav Karlík Miroslav Karlík (Gar.)</i>  | KZ         | 2       | 2P+0C |          | PS   |
| 01ANB3 | <b>Calculus B 3</b><br><i>Miroslav Kolář, Milan Krbálek Miroslav Kolář Milan Krbálek (Gar.)</i>  | Z,ZK       | 8       | 4P+4C |          | PS   |
| 01ANB4 | <b>Calculus B 4</b><br><i>Jiří Mikyška, Miroslav Kolář, Milan Krbálek Milan Krbálek Milan Krbálek (Gar.)</i>   | Z,ZK       | 6       | 2P+4C |          | PS   |
| 12NME1 | <b>Numerical Methods 1</b><br><i>Pavel Váchal Pavel Váchal Pavel Váchal (Gar.)</i>   | Z,ZK       | 4       | 2+2   | L        | PS   |
| 14TEM  | <b>Engineering Mechanics</b><br><i>Jiří Kunz Jiří Kunz Jiří Kunz (Gar.)</i>  | Z,ZK       | 6       | 4     | 5        | PS   |

|        |   |      |   |     |   |    |
|--------|---|------|---|-----|---|----|
| 02TEF1 | <b>Theoretical Physics 1</b><br><i>Petr Novotný Petr Novotný Igor Jex (Gar.)</i>                                    | Z,ZK | 4 | 2+2 | Z | PS |
| 02TSFA | <b>Thermodynamics and Statistical Physics</b><br><i>Igor Jex, Jaroslav Novotný Antonín Hoskovec Igor Jex (Gar.)</i> | Z,ZK | 4 | 2+2 | L | PS |
| 02VOAF | <b>Waves, Optics and Atomic Physics</b><br><i>Josef Schmidt, Petr Novotný Jan Vysoký Jiří Tolar (Gar.)</i>          | Z,ZK | 6 | 4+2 | Z | PS |

**Characteristics of the courses of this group of Study Plan: Code=BSPFIFIM2 Name=BS P\_FIB FIM 2nd year**

|   |  |      |   |
|---|--|------|---|
| 14DYL   | Dynamics of Linear Systems             | Z,ZK | 2 |
| Abstract: Modelling of linear mechanical systems by means of simple computational system of discrete elements. Free and/or forced vibration of mechanical systems with one or two degrees of freedom. Kinetic equations of motion - their determination and solution. Analysis of motion stability.   |  |      |   |
| 14ELM   | Electron Microscopy                    | KZ   | 2 |
| Abstract: In this course the students are introduced to the microscopic methods used for the characterization of materials, thin layers or nanoparticles. The introductory part is dedicated to the analogy of light and electron microscopy and to various types of microscopes. An important part of the course is given to the interaction of different types of radiation with matter, mathematical formulations and tools used in microscopy and to the description of particular parts of the microscopes. Introduction to kinematic and dynamic theory of diffraction, types of contrast, and diffraction and imaging techniques are also covered. A particular attention is given to analytical methods and imaging techniques in atomic resolution.  |  |      |   |
| 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.   |  |      |   |
| 14TEM   | Engineering Mechanics                  | Z,ZK | 6 |
| Abstract: The course represents a link-up between the theoretical mechanics of rigid bodies and engineering disciplines dealing with stress and strain analysis of real structure parts (elasticity, plasticity, fracture mechanics, etc.). Principles of statics, kinematics, and dynamics and their application.  |  |      |   |
| 02TEF1  | Theoretical Physics 1                  | Z,ZK | 4 |
| The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalism as well as different approaches to description of dynamics (Newton's, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2).  |  |      |   |
| 02TSFA  | Thermodynamics and Statistical Physics | Z,ZK | 4 |
| Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect, conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body description from a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is used to discuss simple transport phenomena.   |  |      |   |
| 02VOAF  | Waves, Optics and Atomic Physics       | Z,ZK | 6 |
| Wave phenomena in mechanics and electromagnetism: modes, standing and travelling waves, wave packets in dispersive media. Wave optics: polarization, interference, diffraction, coherence. Geometrical optics. Introduction to quantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves, the Schrodinger equation, stationary states and spectra of finite systems.  |  |      |   |

Code of the group: BSPFIFIM3

Name of the group: BS P\_FIB FIM 3rd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 12 courses

Credits in the group: 0

Note on the group: Zkoušku z předmětu 01RMAF lze skládat až po složení všech zkoušek z Matematické analýzy a Lineární algebry.

| Code   | Name of the course / Name of the group of courses<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 14BPF1 | <b>Bachelor Thesis 1</b><br><i>Jiří Kunz, Ladislav Kalvoda Ladislav Kalvoda (Gar.)</i>   | Z          | 5       | 5C    |          | PS   |
| 14BPF2 | <b>Bachelor Thesis 2</b><br><i>Jiří Kunz, Ladislav Kalvoda Ladislav Kalvoda Jiří Kunz (Gar.)</i>   | Z          | 10      | 10C   |          | PS   |
| 14EM1  | <b>Elasticity 1</b><br><i>Aleš Materna, Vladislav Oliva Vladislav Oliva Vladislav Oliva (Gar.)</i>   | Z,ZK       | 5       | 2P+2C |          | PS   |
| 14FKO  | <b>Metal Physics</b><br><i>Miroslav Karlík, Jaroslav Jech Miroslav Karlík Miroslav Karlík (Gar.)</i>   | Z,ZK       | 6       | 4P+2C |          | PS   |
| 02KF   | <b>Quantum Physics</b><br><i>Filip Petrášek Libor Šnobl (Gar.)</i>   | Z,ZK       | 3       | 2P+1C | Z        | PS   |

|         |   |      |   |        |   |    |
|---------|---|------|---|--------|---|----|
| 01NME2  | <b>Numerical Methods 2</b><br><i>Michal Beneš Michal Beneš Michal Beneš (Gar.)</i>  | KZ   | 2 | 2+0    | L | PS |
| 14PMKOP | <b>Practicum of finite elements methods</b><br><i>Aleš Materna Aleš Materna Aleš Materna (Gar.)</i>                             | ZK   | 3 | 0P+2C  |   | PS |
| 01PRST  | <b>Probability and Statistics</b><br><i>Tomáš Hobza Tomáš Hobza Tomáš Hobza (Gar.)</i>  | Z,ZK | 4 | 3+1    | Z | PS |
| 01RMAF  | <b>Equations of Mathematical Physics</b><br><i>Václav Klika Václav Klika Václav Klika (Gar.)</i>                                | Z,ZK | 7 | 4P+2C  |   | PS |
| 11BSEM  | <b>Bachelor Seminar</b><br><i>Ladislav Kalvoda, Radka Mika Havlíková Ladislav Kalvoda Ladislav Kalvoda (Gar.)</i>               | Z    | 1 | 0P+2C  | L | PS |
| 11ZFPL  | <b>Basic to Solid State Physics</b><br><i>Ladislav Kalvoda, Eva Mihóková Eva Mihóková Ladislav Kalvoda (Gar.)</i>               | KZ   | 2 | 26P+0C | Z | PS |
| 14ZZKOS | <b>Testing and processing of metals and alloys</b><br><i>Radek Mušálek, Hynek Lausmann Hynek Lausmann Hynek Lausmann (Gar.)</i> | Z,ZK | 4 | 2P+2C  |   | PS |

#### Characteristics of the courses of this group of Study Plan: Code=BSPFIFIM3 Name=BS P\_FIB FIM 3rd year

|         |  |      |    |
|---------|--|------|----|
| 14BPF11 | Bachelor Thesis 1<br>Student under guidance of his/her supervisor has been working on the given particular topic for one year.   | Z    | 5  |
| 14BPF12 | Bachelor Thesis 2<br>Student under guidance of his/her supervisor has been working on the given particular topic for one year.   | Z    | 10 |
| 14EM1   | Elasticity 1<br>Abstract: The course represents an introduction for several another lectures on continuum mechanics and the strength of materials. The first part contains a detailed theory of stress, small strains and linear elasticity. The second one represents a logical descent from the continuum mechanics to the practical engineering solution of simple problems on tension, bending, shearing and torsion in the cross section of bars and beams.   | Z,ZK | 5  |
| 14FKO   | Metal Physics<br>Abstract: The physical background of processes encountered in production and thermo-mechanical treatment of metallic materials is described, including solidification, crystal defects, theory of solid solutions, theory of dislocations, diffusion, hardening and softening of metals and alloys.   | Z,ZK | 6  |
| 02KF    | Quantum Physics<br>State description, wave function, postulates of quantum mechanics, Born's statistical interpretation, expectation values, Schrödinger equation, Heisenberg uncertainty principle, quantization of angular momentum, solution of simple systems, hydrogen atom.  | Z,ZK | 3  |
| 01NME2  | Numerical Methods 2<br>The course is devoted to numerical solution of boundary-value problems and initial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations.   | KZ   | 2  |
| 14PMKOP | Practicum of finite elements methods<br>Use of commercial finite element code for solving practical problems in mechanics.   | ZK   | 3  |
| 01PRST  | Probability and Statistics<br>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.  | Z,ZK | 4  |
| 01RMAF  | Equations of Mathematical Physics<br>The subject of this course is solving integral equations, theory of generalized functions, classification of partial differential equations, theory of integral transformations, and solution of partial differential equations (boundary value problem for elliptic PDE, mixed boundary problem for elliptic PDE).   | Z,ZK | 7  |
| 11BSEM  | Bachelor Seminar<br>In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelor's degree projects at the faculty. The second part is designed as a practical training for the defence of the bachelor's degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the student's performance.  | Z    | 1  |
| 11ZFPL  | Basic to Solid State Physics<br>Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids | KZ   | 2  |
| 14ZZKOS | Testing and processing of metals and alloys<br>Tension tests, hardness, impact toughness, technological testing, fatigue testing, creep testing. Light microscopy, preparation of specimens for macro- and micro-observation. Casting, forming, welding, soldering, brazing, powder metallurgy, mechanical machining. Copper alloys, aluminium alloys, titanium alloys, special alloys of non-ferrous metals. Technical drawing and CAD.   | Z,ZK | 4  |

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 6

The role of the block: PV

Code of the group: BSPFIFIMPV2

Name of the group: BS P\_FIB FIM Required optional courses 2nd year

Requirement credits in the group: In this group you have to gain at least 6 credits

Requirement courses in the group:

Credits in the group: 6

Note on the group: Studenti si povinně zapisují předměty alespoň za 6 kreditů.

| Code   | Name of the course / Name of the group of courses<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 14CHMA | <b>Materials Characterization</b><br><i>Petr Haušild, Karel Tesa Karel Tesa Petr Haušild (Gar.)</i>  | KZ         | 4       | 2P+1C |          | PV   |
| 02PRA1 | <b>Experimental Laboratory 1</b><br><i>Libor Škoda, Katarína Křížková Gajdošová, Barbara Antonina Trzeciak, Jaroslav Bielík Jaroslav Bielík Jaroslav Bielík (Gar.)</i> | KZ         | 6       | 0+4   | Z        | PV   |
| 02PRA2 | <b>Experimental Laboratory 2</b><br><i>Libor Škoda, Jaroslav Bielík Jaroslav Bielík Jaroslav Bielík (Gar.)</i>   | KZ         | 6       | 0+4   | L        | PV   |
| 14PMA  | <b>Practicum in Materials</b><br><i>Miroslav Karlík, Karel Tesa Miroslav Karlík Miroslav Karlík (Gar.)</i>   | KZ         | 3       | 0P+2L |          | PV   |

**Characteristics of the courses of this group of Study Plan: Code=BSPFIFIMPV2 Name=BS P\_FIB FIM Required optional courses 2nd year**

|  |                            |    |   |
|--|----------------------------|----|---|
| 14CHMA   | Materials Characterization | KZ | 4 |
| Abstract: The subject is composed of lectures, exercises and discussion regarding the basic methods of characterization. The aim of the subject is to introduce students to the most common methods of materials characterization, their outputs and the interpretation of the obtained data. An emphasis is placed on the individual work of the students with current scientific articles in the field of materials characterization. A part of the subject is an excursion to the laboratories of the department and its collaborating institutions. After passing this subject, the student should be able to choose the adequate characterization method for a particular material and evaluate the obtained results. |                            |    |   |
| 02PRA1   | Experimental Laboratory 1  | KZ | 6 |
| Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with the literature), the implementation of the measurement (acquire of different experimental procedures and routines), will teach writing the records of measurement, processing and evaluation of results. At the same time practically extend the knowledge gained in lectures on physics.   |                            |    |   |
| 02PRA2   | Experimental Laboratory 2  | KZ | 6 |
| Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with the literature), the implementation of the measurement (acquire of different experimental procedures and routines), will teach writing the records of measurement, processing and evaluation of results. At the same time practically extend the knowledge gained in lectures on physics.   |                            |    |   |
| 14PMA  | Practicum in Materials     | KZ | 3 |
| Abstract: The aim of this subject is to introduce students to the basics of scientific work in the form of measurements, data analysis and writing of reports. Simple case studies of materials science are designed to show students the right way of presenting the outputs of their work. The subject is focused on correct data analysis and logical structure of the reports. After completing the subject, the student should be able to individually design, execute and evaluate experiments.  |                            |    |   |

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<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 00EKOT | <b>Economy in Technology</b><br><i>Jana Ková ová</i>   | Z          | 1       | 2+0   |          | PV   |
| 00ETV  | <b>Ethics of Science and Technology</b><br><i>Jakub Hájík Jana Ková ová</i>  | Z          | 1       | 0+2   | L        | PV   |
| 00RET  | <b>Rhetoric</b><br><i>Jana Ková ová Jana Ková ová</i>  | Z          | 1       | 0+2   |          | PV   |
| 00UPRA | <b>Introduction to Law</b><br><i>Martin ech Jana Ková ová</i>  | Z          | 1       | 0+2   |          | PV   |
| 00UPSY | <b>Introduction to Psychology</b><br><i>Jakub Hájík 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**

|   |                                  |   |   |
|---|----------------------------------|---|---|
| 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<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i> | Completion | Credits | Scope | Semester | Role |
|-----------|--|------------|---------|-------|----------|------|
| 04XAMZK   | <b>English for Intermediate Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XAPZK   | <b>English for Advanced Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XCESZZK | <b>Czech for Foreigners – Beginners - Examination</b><br><i>Jana Ková ová, Slav na Brownová</i>  | ZK         | 4       |       | Z        | PV   |
| 04XCESMZK | <b>Czech for Intermediate Students Examination</b><br><i>Jana Ková ová Jana Ková ová Jana Ková ová (Gar.)</i>  | ZK         | 4       |       | Z        | PV   |
| 04XCESPZK | <b>Czech for Foreign Students - Advanced Examination</b><br><i>Jana Ková ová Michal Beneš Jana Ková ová (Gar.)</i>   | ZK         | 4       |       | Z        | PV   |
| 04XFMZK   | <b>French for Intermediate Students Examination</b><br><i>Michal Beneš</i>   | ZK         | 4       |       | Z        | PV   |
| 04XFPZK   | <b>French for Advanced Students Examination</b><br><i>Michal Beneš</i>   | ZK         | 4       |       | Z        | PV   |
| 04XFZZK   | <b>French for Beginners Examination</b><br><i>V ra Šlechtová</i>   | ZK         | 3       |       | L        | PV   |
| 04XNMZK   | <b>German for Intermediate Students Examination</b><br><i>Michal Beneš</i>   | ZK         | 4       |       | Z        | PV   |
| 04XNPZK   | <b>German for Advanced Students Examination</b><br><i>Michal Beneš</i>   | ZK         | 4       |       | Z        | PV   |
| 04XRMZK   | <b>Russian for Intermediate Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XRPZK   | <b>Russian for Advanced Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XRZZK   | <b>Russian for Beginners Examination</b><br><i>V ra Šlechtová</i>  | ZK         | 3       |       | L        | PV   |
| 04XSMZK   | <b>Spanish for Intermediate Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XSPZK   | <b>Spanish for Advanced Students Examination</b><br><i>Michal Beneš</i>  | ZK         | 4       |       | Z        | PV   |
| 04XSZZK   | <b>Spanish for Beginners Examination</b><br><i>V ra Šlechtová</i>  | ZK         | 3       |       | L        | PV   |

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

|  |   |    |   |
|--|---|----|---|
| 04XAMZK  | English for Intermediate Students Examination     | ZK | 4 |
| The course content is the examination as given by the study plan. The examination covers the AM1, AM2, and AM3 courses and consists of two parts - written (100 min) and oral (20-30 min). The student is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English courses.   |   |    |   |
| 04XAPZK  | English for Advanced Students Examination         | ZK | 4 |
| The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (110 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: BSPFIFIMV

Name of the group: BS P\_FIB FIM 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<br>(in case of groups of courses the list of codes of their members)<br><i>Tutors, authors and guarantors (gar.)</i>                | Completion | Credits | Scope | Semester | Role |
|---------|---|------------|---------|-------|----------|------|
| 11APLG  | <b>Applications of Group Theory in Solid State Physics</b><br><i>Zdeněk Potěšil Zdeněk Potěšil Zdeněk Potěšil (Gar.)</i>  | ZK         | 2       | 2     | Z        | v    |
| 02DEF2  | <b>History of Physics 2</b><br><i>Igor Jex Miroslav Myška Igor Jex (Gar.)</i>   | Z          | 2       | 2+0   | L        | v    |
| 11ELEA  | <b>Instrumentation and Measurement</b><br><i>Pavel Jiroušek Pavel Jiroušek Pavel Jiroušek (Gar.)</i>  | Z,ZK       | 2       | 2     | L        | v    |
| 02EXF   | <b>Experimental Physics</b><br><i>Katarína Křížková Gajdošová, Barbara Antonina Trzeciak, Jaroslav Adam, Jaroslava Ůbertová Jaroslava Ůbertová Katarína Křížková Gajdošová (Gar.)</i> | ZK         | 2       | 2P+0C | Z        | v    |
| 04AKS   | <b>English Conversation</b><br><i>Jana Kovářová Jana Kovářová (Gar.)</i>  | Z          | 1       | 0+2   | L        | v    |
| 00MAM1  | <b>Essentials of High School Course 1</b><br><i>David Bejček</i>  | Z          | 1       | 0+1   |          | v    |
| 00MAM2  | <b>Essentials of High School Math Course 2</b><br><i>Lukáš Heriban Severin Pošta Lukáš Heriban (Gar.)</i>   | Z          | 1       | 0+1   |          | v    |
| 12NT    | <b>Nanotechnology</b><br><i>Eduard Hulicius, Jan Proška Jan Proška Eduard Hulicius (Gar.)</i>   | ZK         | 2       | 2+0   | Z        | v    |
| 15CH1   | <b>General Chemistry 1</b><br><i>Ondřej Holas, Petr Distler, Václav Štěpán Petr Distler Petr Distler (Gar.)</i>   | Z          | 3       | 2+1   | Z        | v    |
| 15CH2   | <b>General Chemistry 2</b><br><i>Ondřej Holas, Petr Distler, Václav Štěpán Petr Distler Petr Distler (Gar.)</i>   | Z,ZK       | 3       | 2+1   | L        | v    |
| 12PAS   | <b>Computer Algebra Systems</b><br><i>Milan Šišor Milan Šišor Milan Šišor (Gar.)</i>  | Z          | 2       | 1P+1C | Z        | v    |
| 18PMTL  | <b>Programming in MATLAB</b><br><i>Quang Van Tran, Jaromír Kukal Quang Van Tran Jaromír Kukal (Gar.)</i>  | KZ         | 4       | 4C    | Z        | v    |
| 11SFIPL | <b>Seminar on Solid State Physics</b><br><i>Ladislav Kalvoda Ladislav Kalvoda Ladislav Kalvoda (Gar.)</i>   | KZ         | 2       | 1+1   |          | v    |
| 02SMF   | <b>Seminar of Mathematical Physics</b><br><i>Ladislav Hlavatý (Gar.)</i>  | Z          | 2       | 0+2   | Z        | v    |
| 11SPLA  | <b>Structure of Solid State</b><br><i>Petr Kolenko, Ivo Kraus Petr Kolenko (Gar.)</i>   | Z,ZK       | 4       | 2P+2C | L        | v    |
| TV-1    | <b>Physical Education</b>   | Z          | 1       |       | Z        | v    |
| TV-2    | <b>Physical Education</b>   | Z          | 1       |       | L        | v    |
| TV-3    | <b>Physical education</b>   | Z          | 1       | 0+2   | Z        | v    |
| TV-4    | <b>Physical education</b>   | Z          | 1       | 0+2   | L        | v    |

|         |  |      |   |       |   |   |
|---------|--|------|---|-------|---|---|
| 14TED   | <b>Creating Electronic Documents</b><br><i>Aleš Materna Aleš Materna Aleš Materna (Gar.)</i>                                     | Z    | 2 | 26C   |   | v |
| 01UP1   | <b>Introduction to Probability 1</b><br><i>Jan Vybíral Jan Vybíral Jan Vybíral (Gar.)</i>  | Z,ZK | 3 | 1P+1C |   | v |
| 01UP2   | <b>Introduction to Probability 2</b><br><i>Milan Krbálek Milan Krbálek Milan Krbálek (Gar.)</i>                                  | Z,ZK | 3 | 1P+1C |   | v |
| 12UNXAP | <b>Introduction to UNIX</b><br><i>Milan Kucha ík Milan Kucha ík Milan Kucha ík (Gar.)</i>  | Z    | 2 | 1P+1C | L | v |
| 12UVP   | <b>Introduction to Scientific Computing</b><br><i>Milan Ši or Milan Ši or Milan Ši or (Gar.)</i>                                 | Z    | 2 | 1P+1C | L | v |
| 12ZEL1  | <b>Basic Electronics 1</b><br><i>Jaroslav Pavel Jaroslav Pavel Jaroslav Pavel (Gar.)</i>   | Z,ZK | 3 | 2+1   | Z | v |
| 12ZEL2  | <b>Basic Electronics 2</b><br><i>Jaroslav Pavel Jaroslav Pavel Jaroslav Pavel (Gar.)</i>   | Z,ZK | 3 | 2+1   | L | v |
| 02ZM1   | <b>Foundations of Physical Measurements 1</b><br><i>Libor Škoda, Solangel Rojas Torres, Petr Chaloupka Petr Chaloupka (Gar.)</i> | ZK   | 2 | 2P+0C | Z | v |
| 02ZM2   | <b>Foundations of Physical Measurements 2</b><br><i>Petr Chaloupka Petr Chaloupka (Gar.)</i>                                     | KZ   | 4 | 0P+4L | L | v |
| 12ZAOP  | <b>Fundamentals of Optics</b><br><i>Ivan Richter, Pavel Kwiecien Ivan Richter Ivan Richter (Gar.)</i>                            | Z,ZK | 2 | 2+0   | Z | v |

### Characteristics of the courses of this group of Study Plan: Code=BSPFIFIMV Name=BS P\_FIB FIM Optional courses

|   |   |      |   |
|---|---|------|---|
| 11APLG  | Applications of Group Theory in Solid State Physics | ZK   | 2 |
| Consideration of atomic system symmetry allows, without any quantitative calculations, rigorously and precisely determine how many energy states there are and what interactions and transitions between them may occur. Therefore, the main purpose of this course is to describe the methods by which we can extract the information on the object that symmetry alone will provide. The application of these methods is illustrated by an example of molecular orbitals, inner orbitals of ions in the crystal field environment, normal modes of molecular vibrations, and selection rules for optical absorption transitions.  |   |      |   |
| 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.   |   |      |   |
| 11ELEA  | Instrumentation and Measurement                     | Z,ZK | 2 |
| The course is the introduction to the instrumentation and measurement for physicists.   |   |      |   |
| 02EXF   | Experimental Physics                                | ZK   | 2 |
| The goal of this subject is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are used for such measurements, and the analysis of measured data.   |   |      |   |
| 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 |
| 00MAM2  | Essentials of High School Math Course 2             | Z    | 1 |
| Review of basics of high school mathematics.  |   |      |   |
| 12NT  | Nanotechnology                                      | ZK   | 2 |
| Lectures will introduce students mainly to modern technological methods of preparation of semiconductor, metal and dielectric nanostructures. Physical and chemical fundaments of different technologies (MBE, MOVPE, EBL, sol-gel and colloidal solution) will be explained. Substantive attention will be devoted to epitaxial technologies which are substantial for nanostructure preparation. Particular emphasis will be focused on detail characterization of "in situ" and "ex situ" techniques, their applications for heterostructure and nanostructure growths will be discussed as well. Some supportive technical methods - lithography, diffusion, evaporation, ion implantation, contact and dielectric layer preparation will be mentioned as well as soldering and encasement.   |   |      |   |
| 15CH1   | General Chemistry 1                                 | Z    | 3 |
| The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises.   |   |      |   |
| 15CH2   | General Chemistry 2                                 | Z,ZK | 3 |
| The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises.  |   |      |   |
| 12PAS   | Computer Algebra Systems                            | Z    | 2 |
| Practically oriented introduction to computer algebra systems (CAS): their main characteristics, ways and means of using them. Constituent part is realized in computer classrooms: students acquire basic skills with CAS by solving relatively simple and basic tasks from mathematics and physics.   |   |      |   |
| 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.  |   |      |   |
| 11SFIPL   | Seminar on Solid State Physics                      | KZ   | 2 |
| 1.Introduction of the Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations of diffractive phenomena related to following themes: crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, atomic scattering factor, structural factor, extinction, practical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorder on diffraction pattern, atomization and thermal oscillations, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and standing waves, normal modes, polarization, energy and momentum transport, infinite chain, chain of finite length, boundary conditions, wave packets, group and phase velocity, dispersion, pulses and their propagation, localized modes, anharmonicity 8."debye" module - lattice dynamics and thermal capacity ? theory 9.Simulations: Brillouine zone, dispersion relation, density of states, thermal energy, heat capacity 10."drude" module - dynamics of classical electron gas in 2D ? theory 11.Simulations: diffuse electron movement, electron drift in an external electric field, Haynes and Shockley experiment, electron mobility, electron motion in magnetic field, cyclotron frequency, Hall experiment, magnetoresistance 12.Assignment, elaboration and presentation of the seminar work. |   |      |   |



|   |  |      |   |
|---|--|------|---|
| 02SMF   | Seminar of Mathematical Physics        | Z    | 2 |
| The purpose of the seminar is to illuminate mathematical physics by virtue of solved examples. It is supposed that the teachers of the physics department will present simple tasks concerning their scientific activities that could become the topics of the student's bachelor theses in the next year   |  |      |   |
| 11SPLA  | Structure of Solid State               | Z,ZK | 4 |
| Crystallography has an important role in the modern sciences because of its interdisciplinary nature. The aim of this lecture is to lay the basis of study of solid state physics.  |  |      |   |
| 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          | 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.   |  |      |   |
| 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, Bertrand's paradox 4. Conditional probability, Bayes' theorem, medical diagnosis, Simpson's 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.  |  |      |   |
| 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  |  |      |   |
| 12UVP   | Introduction to Scientific Computing   | Z    | 2 |
| Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom. Students get acquainted with some basic tools for scientific and technical computing, data analysis, data visualisation and algorithm development.   |  |      |   |
| 12ZEL1  | Basic Electronics 1                    | Z,ZK | 3 |
| The subject provides primary knowledge of circuit theory concerning principles of electronic circuits in both stationary and harmonic stable state. Circuit analysis methods for linear circuits include symbolic and complex method are explained. Proper circuit analysis is also lectured. The subject's final part deals with transient effects inside linear circuits.   |  |      |   |
| 12ZEL2  | Basic Electronics 2                    | Z,ZK | 3 |
| The subject follows up with the Basic Electronics 1. Semiconductor elements basic properties are explained. The course's final part deals with basic themes of logical circuits field.  |  |      |   |
| 02ZM1   | Foundations of Physical Measurements 1 | ZK   | 2 |
| The lecture is designed for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering), however, it can be attended by students of other branches. The goal of the lecture is to introduce the basics of physical measurements, the methods of processing and evaluation of acquired data on a PC. Students learn the basic habits of work in a physics lab.   |  |      |   |
| 02ZM2   | Foundations of Physical Measurements 2 | KZ   | 4 |
| The lecture is designed for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering), however, it can be attended by students of other branches. The goal of the lecture is to introduce the basics of physical measurements, the methods of processing and evaluation of acquired data on a PC. Students learn the basic habits of work in a physics lab.   |  |      |   |
| 12ZAOP  | Fundamentals of Optics                 | Z,ZK | 2 |
| The lecture covers the very basics of optics - electromagnetic theory, linear optical physics and material effects, basics of nonlinear effects, and geometrical optics. The main goal of the lecture is to obtain, on the bachelor level, broad and general information on optics, giving an essential orientation in the field, especially with respect to character of the bachelor work. Particular topics are further elaborated during departmental masters program. The lecture stems from the electrodynamic notion of plane waves in vacuum (including polarization effects), and further from material medium. It explains basics of linear and nonlinear response in material medium and dispersion properties. It next informs on consequences in anisotropic media, it explains processes induced by boundary conditions at interfaces. It also discusses the consequences of statistics on interference processes, explains elements of two-wave interference and their applications in interferometers. Based on the Fresnel diffraction integral, diffraction processes are presented in a graphical form, including fundamentals of grating diffraction. Based on this diffraction principle, basic functioning of holography is clarified. Finally, the lecture unravels the geometrical optics limit. It takes notice on geometrical approach imaging, substitutive schema of a paraxial imaging system, and optical aberrations. It shows fundamentals of imaging in optical instruments. |  |      |   |

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<br>(in case of groups of courses the list of codes of their members)<br>Tutors, <b>authors</b> and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
|--------|--|------------|---------|-------|----------|------|
| 04XAM1 | English for Intermediate Students M1   | Z          | 2       | 0+2   | Z        | v    |
| 04XAM2 | English for Intermediate Students M2<br>V ra Šlechtová   | Z          | 2       | 0+2   | L        | v    |
| 04XAM3 | English for Intermediate Students M3<br>V ra Šlechtová   | Z          | 2       | 0+2   | Z        | v    |
| 04XAP1 | English for Advanced Students P1<br>V ra Šlechtová   | Z          | 2       | 0+2   | Z        | v    |

|          |   |   |   |     |   |   |
|----------|---|---|---|-----|---|---|
| 04XAP2   | <b>English for Advanced Students P2</b><br><i>V ra Šlechtová</i>                              | Z | 2 | 0+2 | L | v |
| 04XAP3   | <b>English for Advanced Students P3</b><br><i>V ra Šlechtová</i>                              | Z | 2 | 0+2 | Z | v |
| 04XCESZ1 | <b>Czech for Foreigners - Beginners 1</b><br><i>Jana Ková ová Jana Ková ová (Gar.)</i>        | Z | 2 | 0+2 | Z | v |
| 04XCESZ2 | <b>Czech for Foreigners - Beginners 2</b><br><i>Jana Ková ová Jana Ková ová (Gar.)</i>        | Z | 2 | 0+2 | L | v |
| 04XCESZ3 | <b>Czech for Foreigners - Beginners 3</b><br><i>Jana Ková ová (Gar.)</i>                      | Z | 2 | 2S  | Z | v |
| 04XCESM1 | <b>Czech for Foreigners - Intermediate 1</b>  | Z | 2 | 0+2 | Z | v |
| 04XCESM2 | <b>Czech for Foreigners - Intermediate 2</b><br><i>Jana Ková ová Jana Ková ová (Gar.)</i>     | Z | 2 | 0+2 | L | v |
| 04XCESM3 | <b>Czech for Foreigners - Intermediate 3</b><br><i>V ra Šlechtová Jana Ková ová (Gar.)</i>    | Z | 2 | 0+2 | Z | v |
| 04XCESP1 | <b>Czech for Foreign Students - Advanced 1</b><br><i>Jana Ková ová Jana Ková ová (Gar.)</i>   | Z | 2 | 0+2 | Z | v |
| 04XCESP2 | <b>Czech for Foreigners - Advanced 2</b><br><i>Jana Ková ová Jana Ková ová (Gar.)</i>         | Z | 2 | 0+2 | L | v |
| 04XCESP3 | <b>Czech for Foreigners - Advanced 3</b><br><i>V ra Šlechtová Jana Ková ová (Gar.)</i>        | Z | 2 | 0+2 | Z | v |
| 04XFM1   | <b>French for Intermediate Students M1</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>     | Z | 2 | 0+2 | Z | v |
| 04XFM2   | <b>French for Intermediate Students M2</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>     | Z | 2 | 0+2 | L | v |
| 04XFM3   | <b>French for Intermediate Students M3</b><br><i>V ra Šlechtová</i>                           | Z | 2 | 0+2 | Z | v |
| 04XFP1   | <b>French for Advanced Students P1</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>         | Z | 2 | 0+2 | Z | v |
| 04XFP2   | <b>French for Advanced Students P2</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>         | Z | 2 | 0+2 | L | v |
| 04XFP3   | <b>French for Advanced Students P3</b><br><i>V ra Šlechtová</i>                               | Z | 2 | 0+2 | Z | v |
| 04XFZ1   | <b>French for Beginners Z1</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>                 | Z | 2 | 0+4 | L | v |
| 04XFZ2   | <b>French for Beginners Z2</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>                 | Z | 2 | 0+4 | Z | v |
| 04XFZ3   | <b>French for Beginners Z3</b><br><i>V ra Šlechtová V ra Šlechtová (Gar.)</i>                 | Z | 2 | 0+4 | L | v |
| 04XFZ4   | <b>French for Beginners Z4</b><br><i>V ra Šlechtová</i>                                       | Z | 2 | 0+4 | Z | v |
| 04XFZ5   | <b>French for Beginners Z5</b><br><i>V ra Šlechtová</i>                                       | Z | 2 | 0+4 | L | v |
| 04XNM2   | <b>German for Intermediate Students M2</b><br><i>Miloslava echová Miloslava echová (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XNM1   | <b>German for Intermediate Students M1</b><br><i>V ra Šlechtová Miloslava echová (Gar.)</i>   | Z | 2 | 0+2 | Z | v |
| 04XNM3   | <b>German for Intermediate Students M3</b><br><i>V ra Šlechtová</i>                           | Z | 2 | 0+2 | Z | v |
| 04XNP1   | <b>German for Advanced Students P1</b><br><i>V ra Šlechtová Miloslava echová (Gar.)</i>       | Z | 2 | 0+2 | Z | v |
| 04XNP2   | <b>German for Advanced Students P2</b><br><i>Miloslava echová Miloslava echová (Gar.)</i>     | Z | 2 | 0+2 | L | v |
| 04XNP3   | <b>German for Advanced Students P3</b><br><i>V ra Šlechtová</i>                               | Z | 2 | 0+2 | Z | v |
| 04XRM1   | <b>Russian for Intermediate Students M1</b><br><i>V ra Šlechtová Zhanna Isaeva (Gar.)</i>     | Z | 2 | 0+2 | Z | v |
| 04XRM2   | <b>Russian for Intermediate Students M2</b><br><i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i>      | Z | 2 | 0+2 | L | v |
| 04XRM3   | <b>Russian for Intermediate Students M3</b><br><i>V ra Šlechtová</i>                          | Z | 2 | 0+2 | Z | v |
| 04XRP1   | <b>Russian for Advanced Students P1</b><br><i>V ra Šlechtová Zhanna Isaeva (Gar.)</i>         | Z | 2 | 0+2 | Z | v |
| 04XRP2   | <b>Russian for Advanced Students P2</b><br><i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i>          | Z | 2 | 0+2 | L | v |
| 04XRP3   | <b>Russian for Advanced Students P3</b><br><i>V ra Šlechtová</i>                              | Z | 2 | 0+2 | Z | v |
| 04XRZ1   | <b>Russian for Beginners Z1</b><br><i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i>                  | Z | 2 | 0+4 | L | v |
| 04XRZ2   | <b>Russian for Beginners Z2</b><br><i>V ra Šlechtová Zhanna Isaeva (Gar.)</i>                 | Z | 2 | 0+4 | Z | v |
| 04XRZ3   | <b>Russian for Beginners Z3</b><br><i>Zhanna Isaeva Zhanna Isaeva (Gar.)</i>                  | Z | 2 | 0+4 | L | v |
| 04XRZ4   | <b>Russian for Beginners Z4</b><br><i>V ra Šlechtová</i>                                      | Z | 2 | 0+4 | Z | v |

|        |  |   |   |     |   |   |
|--------|--|---|---|-----|---|---|
| 04XRZ5 | <b>Russian for Beginners Z5</b><br><i>V ra Šlechtová</i>   | Z | 2 | 0+4 | L | v |
| 04XSM1 | <b>Spanish for Intermediate Students M1</b><br><i>Beatriz Vadillo Gonzalo (Gar.)</i>                         | Z | 2 | 0+2 | Z | v |
| 04XSM2 | <b>Spanish for Intermediate Students M3</b><br><i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i> | Z | 2 | 0+2 | L | v |
| 04XSM3 | <b>Spanish for Intermediate Students M3</b><br><i>V ra Šlechtová</i>   | Z | 2 | 0+2 | Z | v |
| 04XSP1 | <b>Spanish for Advanced Students P1</b><br><i>V ra Šlechtová Beatriz Vadillo Gonzalo (Gar.)</i>              | Z | 2 | 0+2 | Z | v |
| 04XSP2 | <b>Spanish for Advanced Students P2</b><br><i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i>     | Z | 2 | 0+2 | L | v |
| 04XSP3 | <b>Spanish for Advanced Students P3</b><br><i>V ra Šlechtová</i>   | Z | 2 | 0+2 | Z | v |
| 04XSZ1 | <b>Spanish for Beginners Z1</b><br><i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i>             | Z | 2 | 0+4 | L | v |
| 04XSZ2 | <b>Spanish for Beginners Students Z2</b><br><i>V ra Šlechtová Beatriz Vadillo Gonzalo (Gar.)</i>             | Z | 2 | 0+4 | Z | v |
| 04XSZ3 | <b>Spanish for Beginners Z3</b><br><i>Beatriz Vadillo Gonzalo Beatriz Vadillo Gonzalo (Gar.)</i>             | Z | 2 | 0+4 | L | v |
| 04XSZ4 | <b>Spanish for Beginners Z4</b><br><i>V ra Šlechtová</i>   | Z | 2 | 0+4 | Z | v |
| 04XSZ5 | <b>Spanish for Beginners Z5</b><br><i>V ra Šlechtová</i>   | Z | 2 | 0+4 | L | v |

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

|   |                                       |   |   |
|---|---------------------------------------|---|---|
| 04XAM1  | English for Intermediate Students M1  | Z | 2 |
| The course is designed for students who have successfully completed the full secondary school English language course at least at the A2 level of the Common European Framework of Reference for Languages (CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into fundamentals of vocabulary and style typical of professional oral and written communication situations. Thus it covers topics related to the student's life and needs as well as topics of subtechnical interest. Attention is also paid to extending the knowledge of grammar issues used in EAP.  |                                       |   |   |
| 04XAM2  | English for Intermediate Students M2  | Z | 2 |
| The AM2 course expects the student to have completed the AM1 course. It develops their skills for work with subtechnical texts, focusing also more on specific grammar, functions, and lexical items typical of ESP and EAP (e.g., definition, existence and classification of phenomena, object descriptions). Part of the course is also guided writing. If necessary, grammar revision is included.  |                                       |   |   |
| 04XAM3  | English for Intermediate Students M3  | Z | 2 |
| The course develops the skills that enable students to cope with features typical of professional style. Increasing attention is paid to developing subtechnical vocabulary and independent understanding of professional texts. Great emphasis is placed on distinguishing different levels of formal and informal oral and written communication and their appropriate Czech equivalents. The course also includes studying abstracts and rules for writing them as well as basic rules for preparing and giving a short presentation on a chosen topic related to the student's field.   |                                       |   |   |
| 04XAP1  | English for Advanced Students P1      | Z | 2 |
| The course is designed for students who have successfully completed the full secondary school English language course (at least the B1 level of the Common European Framework of Reference for Languages - CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into the fundamentals of vocabulary, functions, grammar, and style typical of professional oral and written communication situations (fundamentals of terms in mathematics and physics, definitions, graph descriptions, etc). It also covers professional oral and written communication on topics related to the undergraduate's life and needs. It develops skills for free professional writing (writing a CV, letter of application, polite request). If necessary, revision of selected grammar topics is included. |                                       |   |   |
| 04XAP2  | English for Advanced Students P2      | Z | 2 |
| The AP2 course is based on AP1, thus extending the student's skills for working with subtechnical texts, and even with professional texts of chosen branches of science. According to the students' needs it concentrates on chosen grammar topics, but mainly intends to develop understanding of syntactic structures and typical rhetorical functions (e.g., various types of descriptions, and, if possible, a case study). Increasing emphasis is placed on the undergraduate's independent work with and reading of linguistically more demanding materials. The course extends the student's subtechnical vocabulary, and includes fundamental notions of chosen branches of science. It is focused on formal writing including the sentence and paragraph structure, linking, cohesion and coherence in texts.                    |                                       |   |   |
| 04XAP3  | English for Advanced Students P3      | Z | 2 |
| The AP3 course is based on AP2 and expects the student to work without any guidance with authentic professional materials and to interpret the text. It includes training oral and written communication skills and functions (e.g., expressing an opinion, agreement, and objections; taking part in discussion, note-taking; summarizing, writing an abstract) and, if possible, also preparing a project on a given or chosen topic and presenting it. The course places emphasis on distinguishing levels of formal and informal language both in oral and written communication.   |                                       |   |   |
| 04XCESZ1  | Czech for Foreigners - Beginners 1    | Z | 2 |
| The course is designed for students on 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 communicative situations. The course covers roughly lessons 1-5 in „Chcete mluvit esky“ by H. Remediosová and E. echová. At the end of the course, the students will have reached A1 (CEFR) approximately.   |                                       |   |   |
| 04XCESZ2  | Czech for Foreigners - Beginners 2    | Z | 2 |
| The language and communication competences acquired in CESZ1 are further developed. Students extend their knowledge of Czech declension and conjugation system and practise communication of frequent topics. The course covers roughly lessons 6-10 in „Chcete mluvit esky“ by H. Remediosová and E. echová. At the end of the course, the students will have reached A2 (CEFR) approximately.   |                                       |   |   |
| 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, correct pronunciation, deepening grammar, including grammar practice, and introducing 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“.  |                                       |   |   |
| 04XCESM1  | Czech for Foreigners - Intermediate 1 | Z | 2 |
| The course is focused on correct pronunciation, important morphological phenomena, prepositional phrases, and verb forms as well as on extending the student's vocabulary for various social situations.  |                                       |   |   |

|  |   |   |   |
|--|---|---|---|
| 04XCESM2   | Czech for Foreigners - Intermediate 2   | Z | 2 |
| The course develops the topics covered in CESM1 and is then focused on more difficult grammar phenomena. It practices writing, speaking, and reading skills and trains the student in understanding common abbreviations, abbreviated words, and mathematical terms and formulas.  |   |   |   |
| 04XCESM3   | Czech for Foreigners - Intermediate 3   | Z | 2 |
| The last course revises morphological topics covered earlier and extends the student's knowledge of more difficult language phenomena. It is especially focused on stylistics and lexicology and on developing the student's writing skills.   |   |   |   |
| 04XCESP1   | Czech for Foreign Students - Advanced 1 | Z | 2 |
| The prerequisite of the course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common European Framework of Reference. It is focused partly on revision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of science. Students are taught the basics of functional style of engineering and professional communication, both in spoken and written form. The topics include University Studies and Student Life. Written practice includes communication with teachers and faculty administrators.  |   |   |   |
| 04XCESP2   | Czech for Foreigners - Advanced 2       | Z | 2 |
| This course extends the student's knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical and specialist texts placing greater emphasis on individual work.   |   |   |   |
| 04XCESP3   | Czech for Foreigners - Advanced 3       | Z | 2 |
| The course develops the student's knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation, and, finally, presentation of the student's project. Writing skills necessary for professional communication are trained.  |   |   |   |
| 04XFM1   | French for Intermediate Students M1     | Z | 2 |
| French - intermediate FM The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and professional environment. They will be able to use the language to transmit general and technical information and to solve problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, systemizes and expands language skills gained in previous study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these texts.  |   |   |   |
| 04XFM2   | French for Intermediate Students M2     | Z | 2 |
| Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material.   |   |   |   |
| 04XFM3   | French for Intermediate Students M3     | Z | 2 |
| The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students' future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one's own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence.   |   |   |   |
| 04XFP1   | French for Advanced Students P1         | Z | 2 |
| FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-impairfait, 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 začáteky). 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.  |   |   |   |

|   |   |          |          |
|---|---|----------|----------|
| <b>04XNM2</b>   | <b>German for Intermediate Students M2</b>  | <b>Z</b> | <b>2</b> |
| 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).  |   |          |          |
| <b>04XNM1</b>   | <b>German for Intermediate Students M1</b>  | <b>Z</b> | <b>2</b> |
| 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.  |   |          |          |
| <b>04XNM3</b>   | <b>German for Intermediate Students M3</b>  | <b>Z</b> | <b>2</b> |
| 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).  |   |          |          |
| <b>04XNP1</b>   | <b>German for Advanced Students P1</b>      | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XNP2</b>   | <b>German for Advanced Students P2</b>      | <b>Z</b> | <b>2</b> |
| 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).   |   |          |          |
| <b>04XNP3</b>   | <b>German for Advanced Students P3</b>      | <b>Z</b> | <b>2</b> |
| 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.  |   |          |          |
| <b>04XRM1</b>   | <b>Russian for Intermediate Students M1</b> | <b>Z</b> | <b>2</b> |
| 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.  |   |          |          |
| <b>04XRM2</b>   | <b>Russian for Intermediate Students M2</b> | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRM3</b>   | <b>Russian for Intermediate Students M3</b> | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRP1</b>   | <b>Russian for Advanced Students P1</b>     | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRP2</b>   | <b>Russian for Advanced Students P2</b>     | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRP3</b>   | <b>Russian for Advanced Students P3</b>     | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRZ1</b>   | <b>Russian for Beginners Z1</b>             | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRZ2</b>   | <b>Russian for Beginners Z2</b>             | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRZ3</b>   | <b>Russian for Beginners Z3</b>             | <b>Z</b> | <b>2</b> |
| 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.   |   |          |          |
| <b>04XRZ4</b>   | <b>Russian for Beginners Z4</b>             | <b>Z</b> | <b>2</b> |
| 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<br>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   | Z          | 1       |
| 00MAM2 | Essentials of High School Math Course 2<br>Review of basics of high school mathematics.  | Z          | 1       |
| 00PT   | Preparatory Week   | Z          | 2       |
| 00RET  | Rhetoric<br>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.  | Z          | 1       |
| 00UPRA | Introduction to Law  | Z          | 1       |
| 00UPSY | Introduction to Psychology   | Z          | 1       |
| 01ANB3 | Calculus B 3<br>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 | Z,ZK       | 8       |

|   |                                   |      |   |
|---|-----------------------------------|------|---|
| series and their convergence. 5. Differential calculus of functions of several variables - limit, continuity, partial and directional derivative, gradient, total derivatives and tangent plane, Taylor series, elementary terms of vector analysis, Jacobi matrix. 6. Functions defined implicitly by one or several equations.  |                                   |      |   |
| 01ANB4  | Calculus B 4                      | Z,ZK | 6 |
| [1] Diferenciální počet funkcí více proměnných a funkcionálních vektorů. [2] Funkce zadané implicitně. [3] Taylorovy řady funkce více proměnných. [4] Regulární zobrazení, záměna proměnných, nekartézské soustavy souřadnic. [5] Lokální, vázané a globální 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, Fubiniova věta, vztah o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální vektorový. ty. |                                   |      |   |
| 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 |
| 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 |
| 01NME2  | Numerical Methods 2               | KZ   | 2 |
| The course is devoted to numerical solution of boundary-value problems and initial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations.   |                                   |      |   |
| 01PRST  | Probability and Statistics        | Z,ZK | 4 |
| It is a basic course of probability theory and mathematical statistics. The probability theory is built 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.   |                                   |      |   |
| 01RMAF  | Equations of Mathematical Physics | Z,ZK | 7 |
| The subject of this course is solving integral equations, theory of generalized functions, classification of partial differential equations, theory of integral transformations, and solution of partial differential equations (boundary value problem for elliptic PDE, mixed boundary problem for elliptic PDE).   |                                   |      |   |
| 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, Bertrand's paradox 4.Conditional probability, Bayes' theorem, medical diagnosis, Simpson's 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.  |                                   |      |   |
| 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 Orient and Greece, Greek natural philosophers, Aristotle. Physics in Hellenistic period, Archimedes. 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.   |                                   |      |   |
| 02ELMA  | Electricity and Magnetism         | Z,ZK | 6 |
| Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamics forces, magnetic field. Magnetic dipole, magnetism. Electromagnetic induction, AC currents. Electromagnetic waves, Maxwell equations  |                                   |      |   |
| 02EXF   | Experimental Physics              | ZK   | 2 |
| The goal of this subject is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are used for such measurements, and the analysis of measured data.   |                                   |      |   |
| 02KF  | Quantum Physics                   | Z,ZK | 3 |
| State description, wave function, postulates of quantum mechanics, Born's statistical interpretation, expectation values, Schrödinger equation, Heisenberg uncertainty principle, quantization of angular momentum, solution of simple systems, hydrogen atom.  |                                   |      |   |
| 02MECH  | Mechanics                         | Z    | 4 |
| Introduction to physics, physical quantities and units. Particle kinematics, basic types of motion and their superposition. Particle dynamics, one-dimensional equations of motion, motion in central force field, forces in noninertial reference frames. Mechanics of system of free particles, two-body problem, collisions. Mechanics of rigid body, rotation. Fundamentals of continuum mechanics, elasticity, hydrodynamics. Sound.   |                                   |      |   |
| 02MECHZ   | Mechanics - Examination           | ZK   | 2 |
| The content of the subject is the examination according to the plan of studies.   |                                   |      |   |
| 02PRA1  | Experimental Laboratory 1         | KZ   | 6 |
| Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE (branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the other specializations. In Experimental laboratory students learn how to prepare for experiments (including work with the literature), the implementation of the measurement (acquire of different experimental procedures and routines), will teach writing the records of measurement, processing and evaluation of results. At the same time practically extend the knowledge gained in lectures on physics.            |                                   |      |   |

|   |  |             |          |
|---|--|-------------|----------|
| <b>02PRA2</b>   | <b>Experimental Laboratory 2</b>                     | <b>KZ</b>   | <b>6</b> |
| Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with theliterature), the implementation of the measurement (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluation of results. At the same time practically extendthe knowledge gained in lectures on physics.   |  |             |          |
| <b>02SMF</b>  | <b>Seminar of Mathematical Physics</b>               | <b>Z</b>    | <b>2</b> |
| The purpose of the seminar is to illuminate mathematical physics by virtue of solved examples. It is supposed that the teachers of the physics department will present simple tasks concerning their scientific activities that could become the topics of the student?s bachelor theses in the next year   |  |             |          |
| <b>02TEF1</b>   | <b>Theoretical Physics 1</b>                         | <b>Z,ZK</b> | <b>4</b> |
| The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalism as well as diferent approaches to description of dynamics (Newton's, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2).   |  |             |          |
| <b>02TER</b>  | <b>Heat and Molecular Physics</b>                    | <b>Z,ZK</b> | <b>4</b> |
| Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution,equipartition theorem.  |  |             |          |
| <b>02TSFA</b>   | <b>Thermodynamics and Statistical Physics</b>        | <b>Z,ZK</b> | <b>4</b> |
| Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect,conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is usedto discusses simple transport phenomena.  |  |             |          |
| <b>02VOAF</b>   | <b>Waves, Optics and Atomic Physics</b>              | <b>Z,ZK</b> | <b>6</b> |
| Wave phenomena in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polariztion, interference, diffraction, coherence. Geometrical optics. Introduction toquantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves,the Schrodinger equation, stationary states and spectra of finite systems.  |  |             |          |
| <b>02ZM1</b>  | <b>Foundations of Physical Measurements 1</b>        | <b>ZK</b>   | <b>2</b> |
| The lecture is designed for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering), however, it can be attended by students of other branches. The goal of the lecture is to introduce the basics of physical measurements, the methods of processing and evaluation of acquired data on a PC. Students learn the basic habits of work in a physics lab.   |  |             |          |
| <b>02ZM2</b>  | <b>Foundations of Physical Measurements 2</b>        | <b>KZ</b>   | <b>4</b> |
| The lecture is designed for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering), however, it can be attended by students of other branches. The goal of the lecture is to introduce the basics of physical measurements, the methods of processing and evaluation of acquired data on a PC. Students learn the basic habits of work in a physics lab.   |  |             |          |
| <b>04AKS</b>  | <b>English Conversation</b>                          | <b>Z</b>    | <b>1</b> |
| 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.  |  |             |          |
| <b>04XAM1</b>   | <b>English for Intermediate Students M1</b>          | <b>Z</b>    | <b>2</b> |
| 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.  |  |             |          |
| <b>04XAM2</b>   | <b>English for Intermediate Students M2</b>          | <b>Z</b>    | <b>2</b> |
| 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.  |  |             |          |
| <b>04XAM3</b>   | <b>English for Intermediate Students M3</b>          | <b>Z</b>    | <b>2</b> |
| 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.   |  |             |          |
| <b>04XAMZK</b>  | <b>English for Intermediate Students Examination</b> | <b>ZK</b>   | <b>4</b> |
| 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.  |  |             |          |
| <b>04XAP1</b>   | <b>English for Advanced Students P1</b>              | <b>Z</b>    | <b>2</b> |
| 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. |  |             |          |
| <b>04XAP2</b>   | <b>English for Advanced Students P2</b>              | <b>Z</b>    | <b>2</b> |
| 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.                    |  |             |          |
| <b>04XAP3</b>   | <b>English for Advanced Students P3</b>              | <b>Z</b>    | <b>2</b> |
| The AP3 course is based on AP2 and expects the student to work without any guidance with authentic professional materials and to interpret the text. It includes training oral and written communication skills and functions (e.g., expressing an opinion, agreement, and objections; taking part in discussion, note-taking; summarizing, writing an abstract) and, if possible, also preparing a project on a given or chosen topic and presenting it. The course places emphasis on distinguishing levels of formal and informal language both in oral and written communication.   |  |             |          |



|   |   |    |   |
|---|---|----|---|
| 04XAPZK   | English for Advanced Students Examination         | ZK | 4 |
| The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (110 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 on 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 communicative situations. The course covers roughly lessons 1-5 in „Chcete mluvit esky“ by H. Remediosová and E. echová. At the end of the course, the students will have reached A1 (CEFR) approximately.   |   |    |   |
| 04XCESZ2  | Czech for Foreigners - Beginners 2                | Z  | 2 |
| The language and communication competences acquired in CESZ1 are further developed. Students extend their knowledge of Czech declension and conjugation system and practise communication of frequent topics. The course covers roughly lessons 6-10 in „Chcete mluvit esky“ by H. Remediosová and E. echová. At the end of the course, the students will have reached A2 (CEFR) approximately.   |   |    |   |
| 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, correct pronunciation, deepening grammar, including grammar practice, and introducing 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. |   |    |   |

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| <b>04XFP2</b>  | <b>French for Advanced Students P2</b>              | <b>Z</b>  | <b>2</b> |
| 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).   |   |           |          |
| <b>04XFP3</b>  | <b>French for Advanced Students P3</b>              | <b>Z</b>  | <b>2</b> |
| 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.   |   |           |          |
| <b>04XFPZK</b>   | <b>French for Advanced Students Examination</b>     | <b>ZK</b> | <b>4</b> |
| 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.  |   |           |          |
| <b>04XFZ1</b>  | <b>French for Beginners Z1</b>                      | <b>Z</b>  | <b>2</b> |
| 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 začáteky). 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. |   |           |          |
| <b>04XFZ2</b>  | <b>French for Beginners Z2</b>                      | <b>Z</b>  | <b>2</b> |
| 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.  |   |           |          |
| <b>04XFZ3</b>  | <b>French for Beginners Z3</b>                      | <b>Z</b>  | <b>2</b> |
| 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.   |   |           |          |
| <b>04XFZ4</b>  | <b>French for Beginners Z4</b>                      | <b>Z</b>  | <b>2</b> |
| 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.  |   |           |          |
| <b>04XFZ5</b>  | <b>French for Beginners Z5</b>                      | <b>Z</b>  | <b>2</b> |
| 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.  |   |           |          |
| <b>04XFZZK</b>   | <b>French for Beginners Examination</b>             | <b>ZK</b> | <b>3</b> |
| 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.  |   |           |          |
| <b>04XNM1</b>  | <b>German for Intermediate Students M1</b>          | <b>Z</b>  | <b>2</b> |
| 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.   |   |           |          |
| <b>04XNM2</b>  | <b>German for Intermediate Students M2</b>          | <b>Z</b>  | <b>2</b> |
| 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).   |   |           |          |
| <b>04XNM3</b>  | <b>German for Intermediate Students M3</b>          | <b>Z</b>  | <b>2</b> |
| 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).   |   |           |          |
| <b>04XNMZK</b>   | <b>German for Intermediate Students Examination</b> | <b>ZK</b> | <b>4</b> |
| 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 04XNM3 assessment. More detailed information is to be obtained from the teacher.   |   |           |          |
| <b>04XNP1</b>  | <b>German for Advanced Students P1</b>              | <b>Z</b>  | <b>2</b> |
| 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.  |   |           |          |
| <b>04XNP2</b>  | <b>German for Advanced Students P2</b>              | <b>Z</b>  | <b>2</b> |
| 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).  |   |           |          |
| <b>04XNP3</b>  | <b>German for Advanced Students P3</b>              | <b>Z</b>  | <b>2</b> |
| 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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| <b>04XNPZK</b>  | <b>German for Advanced Students Examination</b>      | <b>ZK</b> | <b>4</b> |
| 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.  |  |           |          |
| <b>04XRM1</b>   | <b>Russian for Intermediate Students M1</b>          | <b>Z</b>  | <b>2</b> |
| 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.  |  |           |          |
| <b>04XRM2</b>   | <b>Russian for Intermediate Students M2</b>          | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRM3</b>   | <b>Russian for Intermediate Students M3</b>          | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRMZK</b>  | <b>Russian for Intermediate Students Examination</b> | <b>ZK</b> | <b>4</b> |
| 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.  |  |           |          |
| <b>04XRP1</b>   | <b>Russian for Advanced Students P1</b>              | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRP2</b>   | <b>Russian for Advanced Students P2</b>              | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRP3</b>   | <b>Russian for Advanced Students P3</b>              | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRPZK</b>  | <b>Russian for Advanced Students Examination</b>     | <b>ZK</b> | <b>4</b> |
| 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.  |  |           |          |
| <b>04XRZ1</b>   | <b>Russian for Beginners Z1</b>                      | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRZ2</b>   | <b>Russian for Beginners Z2</b>                      | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRZ3</b>   | <b>Russian for Beginners Z3</b>                      | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XRZ4</b>   | <b>Russian for Beginners Z4</b>                      | <b>Z</b>  | <b>2</b> |
| 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. |  |           |          |
| <b>04XRZ5</b>   | <b>Russian for Beginners Z5</b>                      | <b>Z</b>  | <b>2</b> |
| 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.)   |  |           |          |
| <b>04XRZZK</b>  | <b>Russian for Beginners Examination</b>             | <b>ZK</b> | <b>3</b> |
| 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.  |  |           |          |
| <b>04XSM1</b>   | <b>Spanish for Intermediate Students M1</b>          | <b>Z</b>  | <b>2</b> |
| 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.  |  |           |          |
| <b>04XSM2</b>   | <b>Spanish for Intermediate Students M3</b>          | <b>Z</b>  | <b>2</b> |
| 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.  |  |           |          |
| <b>04XSM3</b>   | <b>Spanish for Intermediate Students M3</b>          | <b>Z</b>  | <b>2</b> |
| 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.   |  |           |          |
| <b>04XSMZK</b>  | <b>Spanish for Intermediate Students Examination</b> | <b>ZK</b> | <b>4</b> |
| 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.   |   |      |   |
| 11APLG  | Applications of Group Theory in Solid State Physics | ZK   | 2 |
| Consideration of atomic system symmetry allows, without any quantitative calculations, rigorously and precisely determine how many energy states there are and what interactions and transitions between them may occur. Therefore, the main purpose of this course is to describe the methods by which we can extract the information on the object that symmetry alone will provide. The application of these methods is illustrated by an example of molecular orbitals, inner orbitals of ions in the crystal field environment, normal modes of molecular vibrations, and selection rules for optical absorption transitions.  |   |      |   |
| 11BSEM  | Bachelor Seminar                                    | Z    | 1 |
| In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelor's degree projects at the faculty. The second part is designed as a practical training for the defence of the bachelor's degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the student's performance.   |   |      |   |
| 11ELEA  | Instrumentation and Measurement                     | Z,ZK | 2 |
| The course is the introduction to the instrumentation and measurement for physicists.   |   |      |   |
| 11SFIPL   | Seminar on Solid State Physics                      | KZ   | 2 |
| 1.Introduction of the Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations of diffractive phenomena related to following themes: crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, atomic scattering factor, structural factor, extinction, practical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorder on diffraction pattern, atomization and thermal oscillations, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and standing waves, normal modes, polarization, energy and momentum transport, infinite chain, chain of finite length, boundary conditions, wave packets, group and phase velocity, dispersion, pulses and their propagation, localized modes, anharmonicity 8."debye" module - lattice dynamics and thermal capacity ? theory 9.Simulations: Brillouine zone, dispersion relation, density of states, thermal energy, heat capacity 10."drude" module - dynamics of classical electron gas in 2D ? theory 11.Simulations: diffuse electron movement, electron drift in an external electric field, Haynes and Shockley experiment, electron mobility, electron motion in magnetic field, cyclotron frequency, Hall experiment, magnetoresistance 12.Assignment, elaboration and presentation of the seminar work. |   |      |   |
| 11SPLA  | Structure of Solid State                            | Z,ZK | 4 |
| Crystallography has an important role in the modern sciences because of its interdisciplinary nature.The aim of this lecture is to lay the basis of study of solid state physics.   |   |      |   |
| 11ZFPL  | Basic to Solid State Physics                        | KZ   | 2 |
| Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids  |   |      |   |
| 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.   |   |      |   |
| 12NT  | Nanotechnology                                      | ZK   | 2 |
| Lectures will introduce students mainly to modern technological methods of preparation of semiconductor, metal and dielectric nanostructures. Physical and chemical fundamentals of different technologies (MBE, MOVPE, EBL, sol-gel and colloidal solution) will be explained. Substantive attention will be devoted to epitaxial technologies which are substantial for nanostructure preparation. Particular emphasis will be focused on detail characterization of "in situ" and "ex situ" techniques, their applications for heterostructure and nanostructure   |   |      |   |

growths will be discussed as well. Some supportive technical methods - lithography, diffusion, evaporation, ion implantation, contact and dielectric layer preparation will be mentioned as well as soldering and encasement.

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| 12PAS   | Computer Algebra Systems                    | Z    | 2  |
| Practically oriented introduction to computer algebra systems (CAS): their main characteristics, ways and means of using them. Constituent part is realized in computer classrooms: students acquire basic skills with CAS by solving relatively simple and basic tasks from mathematics and physics.   |   |      |    |
| 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 configutation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications  |   |      |    |
| 12UVP   | Introduction to Scientific Computing        | Z    | 2  |
| Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom.Students get acquainted with some basic tools fort scientific and technicval computing, data analysis, data visualisation and algorithm development.  |   |      |    |
| 12ZAOP  | Fundamentals of Optics                      | Z,ZK | 2  |
| The lecture covers the very basics of optics - electromagnetic theory, linear optical physics and material effects, basics of nonlinear effects, and geometrical optics. The main goal of the lecture is to obtain, on the bachelor level, broad and general information on optics, giving an essential orientation in the field, especially with respect to character of the bachelor work. Particular topics are further elaborated during departmental masters program. The lecture stems from the electrodynamic notion of plane waves in vacuum (including polarization effects), and further from material medium. It explains basics of linear and nonlinear response in material medium and dispersion properties. It next informs on consequences in anisotropic media, it explains processes induced by boundary conditions at interfaces. It also discusses the consequences of statistics on interference processes, explains elements of two-wave interference and their applications in interferometers. Based on the Fresnel diffraction integral, diffraction processes are presented in a graphical form, including fundamentals of grating diffraction. Based on this diffraction principle, basic functioning of holography is clarified. Finally, the lecture unravels the geometrical optics limit. It takes notice on geometrical approach imaging, substitutive schema of a paraxial imaging system, and optical aberrations. It shows fundamentals of imaging in optical instruments. |   |      |    |
| 12ZEL1  | Basic Electronics 1                         | Z,ZK | 3  |
| The subject provides primary knowledge of circuit theory concerning principles of electronic circuits in both stationary and harmonic stable state. Circuit analysis methods for linear circuits include symbolic and complex method are explained. Proper circuit analysis is also lectured. The subject's final part deals with transient effects inside linear circuits.   |   |      |    |
| 12ZEL2  | Basic Electronics 2                         | Z,ZK | 3  |
| The subject follows up with the Basic Electronics 1. Semiconductor elements basic properties are explained. Thecourse's final part deals with basic themes of logical circuits field.   |   |      |    |
| 14BPF11   | Bachelor Thesis 1                           | Z    | 5  |
| Student under guidance of his/her supervisor has been working on the given particular topic for one year.   |   |      |    |
| 14BPF12   | Bachelor Thesis 2                           | Z    | 10 |
| Student under guidance of his/her supervisor has been working on the given particular topic for one year.   |   |      |    |
| 14CHMA  | Materials Characterization                  | KZ   | 4  |
| Abstract: The subject is composed of lectures, exercises and discussion regarding the basic methods of characterization. The aim of the subject is to introduce students to the most common methods of materials characterization, their outputs and the interpretation of the obtained data. An emphasis is placed on the individual work of the students with current scientific articles in the field of materials characterization. A part of the subject is an excursion to the laboratories of the department and its collaborating institutions. After passing this subject, the student should be able to choose the adequate characterization method for a particular material and evaluate the obtained results.  |   |      |    |
| 14DYLS  | Dynamics of Linear Systems                  | Z,ZK | 2  |
| Abstract: Modelling of linear mechanical systems by means of simple computational system of discrete elements. Free and/or forced vibration of mechanical systems with one or two degrees of freedom. Kinetic equations of motion - their determination and solution. Analysis of motion stability.   |   |      |    |
| 14ELM   | Electron Microscopy                         | KZ   | 2  |
| Abstract: In this course the students are introduced to the microscopic methods used for the characterization of materials, thin layers or nanoparticles. The introductory part is dedicated to the analogy of light and electron microscopy and to various types of microscopes. An important part of the course is given to the interaction of different types of radiation with matter, mathematical formulations and tools used in microscopy and to the description of particular parts of the microscopes. Introduction to kinematic and dynamic theory of diffraction, types of contrast, and diffraction and imaging techniques are also covered. A particular attention is given to analytical methods and imaging techniques in atomic resolution.  |   |      |    |
| 14EM1   | Elasticity 1                                | Z,ZK | 5  |
| Abstract: The course represents an introduction for several another lectures on continuum mechanics and the strength of materials. The first part contains a detailed theory of stress, small strains and linear elasticity. The second one represents a logical descent from the continuum mechanics to the practical engineering solution of simple problems on tension, bending, shearing and torsion in the cross section of bars and beams.  |   |      |    |
| 14FKO   | Metal Physics                               | Z,ZK | 6  |
| Abstract: The physical background of processes encountered in production and thermo-mechanical treatment of metallic materials is described, including solidification, crystal defects, theory of solid solutions, theory of dislocations, diffusion, hardening and softening of metals and alloys.   |   |      |    |
| 14PMA   | Practicum in Materials                      | KZ   | 3  |
| Abstract: The aim of this subject is to introduce students to the basics of scientific work in the form of measurements, data analysis and writing of reports. Simple case studies of materials science are designed to show students the right way of presenting the outputs of their work. The subject is focused on correct data analysis and logical structure of the reports. After completing the subject, the student should be able to individually design, execute and evaluate experiments.   |   |      |    |
| 14PMKOP   | Practicum of finite elements methods        | ZK   | 3  |
| Use of commercial finite element code for solving practical problems in mechanics.  |   |      |    |
| 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.   |   |      |    |
| 14TEM   | Engineering Mechanics                       | Z,ZK | 6  |
| Abstract: The course represents a link-up between the theoretical mechanics of rigid bodies and engineering disciplines dealing with stress and strain analysis of real structure parts (elasticity, plasticity, fracture mechanics, etc.). Principles of statics, kinematics, and dynamics and their application.  |   |      |    |
| 14ZZKOS   | Testing and processing of metals and alloys | Z,ZK | 4  |
| Tension tests, hardness, impact toughness, technological testing, fatigue testing, creep testing. Light microscopy, preparation of specimens for macro- and micro-observation. Casting, forming, welding, soldering, brazing, powder metallurgy, mechanical machining. Copper alloys, aluminium alloys, titanium alloys, special alloys of non-ferrous metals. Technical drawing and CAD.   |   |      |    |
| 15CH1   | General Chemistry 1                         | Z    | 3  |
| The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises.   |   |      |    |

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| 15CH2  | General Chemistry 2         | Z,ZK | 3 |
| The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises. |                             |      |   |
| 17UING   | Introduction to Engineering | KZ   | 3 |
| This course provides introduction to engineering skills. Students should gain general engineering skills at basic level (e.g. material properties and behavior, basics of manufacturing and production, quality assurance, environmental impacts,...). In addition, the introduction to scientific work and technical drawing will be included.  |                             |      |   |
| 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.   |                             |      |   |
| 18ZPRO   | Basics of Programming       | Z    | 4 |
| This course is intended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in programming and with the Python programming language.   |                             |      |   |
| TV-1   | Physical Education          | Z    | 1 |
| TV-2   | Physical Education          | Z    | 1 |
| TV-3   | Physical education          | Z    | 1 |
| TV-4   | Physical education          | Z    | 1 |

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