# Study plan

## Name of study plan: jaderné inženýrství - Radioaktivita v životním prostředí

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Nuclear Engineering
Type of study: Bachelor full-time
Required credits: 0
Elective courses credits: 180
Sum of credits in the plan: 180
Note on the plan:

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Name of the block: Compulsory courses in the specialization
Minimal number of credits of the block: 0
The role of the block: PS

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Code of the group: BSPJIRZP1
Name of the group: BS P_JIB RŽP 1st year
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 16 courses
Credits in the group: 0
Note on the group:

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 02DEF1 | **History of Physics 1** *Igor Jex* ***Igor Jex*** *(Gar.)* | Z | 2 | 2+0 | Z | PS |
| 02ELMA | **Electricity and Magnetism** *Iskender Yalcinkaya, Jiří Hrivnák, Goce Chadzitaskos, Josef Schmidt, Jan Vysoký* ***Jan Vysoký*** *Jiří Hrivnák (Gar.)* | Z,ZK | 6 | 4+2 | L | PS |
| 01LAL | **Linear Algebra 1** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)* | Z | 2 | 2P+2C | | PS |
| 01LALZ | **Linear Algebra 1, exam** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)* | ZK | 2 | 0P+0C | | PS |
| 01LAL2 | **Linear Algebra 2** *Petr Ambrož, Lubomíra Dvořáková* ***Lubomíra Dvořáková*** *Lubomíra Dvořáková (Gar.)* | Z,ZK | 4 | 2P+2C | | PS |
| 01MAN | **Calculus 1** *Pavel Strachota, Miroslav Kolář, Edita Pelantová* ***Pavel Strachota*** *Pavel Strachota (Gar.)* | Z | 4 | 4+4 | | PS |
| 01MANZ | **Calculus 1, exam** *Pavel Strachota, Miroslav Kolář, Edita Pelantová* ***Pavel Strachota*** *Pavel Strachota (Gar.)* | ZK | 4 | 0P+0C | | PS |
| 01MAN2 | **Calculus 2** *Miroslav Kolář, Edita Pelantová, Maksym Dreval* ***Edita Pelantová*** *Maksym Dreval (Gar.)* | Z,ZK | 8 | 4P+4C | | PS |
| 02MECH | **Mechanics** *David Břeň* ***Antonín Hoskovec*** *David Břeň (Gar.)* | Z | 4 | 4+2 | Z | PS |
| 02MECHZ | **Mechanics - Examination** *Iskender Yalcinkaya, Goce Chadzitaskos, Stanislav Skoupý, David Břeň, Filip Petrásek, Antonín Hoskovec, Petr Novotný* ***Antonín Hoskovec*** *David Břeň (Gar.)* | ZK | 2 | - | Z | PS |
| 00PT | **Preparatory Week** *Petr Ambrož, Milan Krbálek* ***Petr Ambrož*** *Petr Ambrož (Gar.)* | Z | 2 | týden | Z | PS |
| 02TER | **Heat and Molecular Physics** *Filip Petrásek* ***Petr Novotný*** *Petr Jizba (Gar.)* | Z,ZK | 4 | 2+2 | L | PS |
| 16UJRF1 | **Introductory Nuclear and Radiation Physics 1** *Ladislav Musílek* ***Ladislav Musílek*** *Ladislav Musílek (Gar.)* | Z,ZK | 4 | 2P+2C | L | PS |
| 02ZM1 | **Foundations of Physical Measurements 1** *Solangel Rojas Torres, Petr Chaloupka Petr Chaloupka (Gar.)* | ZK | 2 | 2P+0C | Z | PS |

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| 02ZM2 | **Foundations of Physical Measurements 2**<br>*Petr Chaloupka Petr Chaloupka (Gar.)* | KZ | 4 | 0P+4L | L | PS |
| 18ZPRO | **Basics of Programming**<br>*Maksym Dreval, Nichita Vatamaniuc, Jan Vondruška, Vladimír Jarý, Miroslav Virius, Jakub Klinkovský, Petr Pauš, František Voldřich, Jan Tomsa, .....* ***Miroslav Virius*** *Miroslav Virius (Gar.)* | Z | 4 | 4C | Z | PS |

**Characteristics of the courses of this group of Study Plan: Code=BSPJIRZP1 Name=BS P_JIB RŽP 1st year**

| | | | |
|---|---|---|---|
| 02DEF1 | History of Physics 1 | Z | 2 |
| Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Physics in Helenistic period, Archimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kepler, Galileo, Huygens. The birth of physics as experimental science. Newton and his work. | | | |
| 02ELMA | Electricity and Magnetism | Z,ZK | 6 |
| Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamic forces, magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, RLC circuits. Electromagnetic waves, Maxwell equations. | | | |
| 01LAL | Linear Algebra 1 | Z | 2 |
| 1. Vector space. 2. Linear dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6. Matrices of linear mappings. 7. Frobenius theorem. | | | |
| 01LALZ | Linear Algebra 1, exam | ZK | 2 |
| 01LAL2 | Linear Algebra 2 | Z,ZK | 4 |
| Outline: 1. Inverse matrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. Hermitian and quadratic forms. 5. Scalar product and orthogonality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of inverse matrices. 2. Methods of calculation of determinants. 3. Calculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and orthogonality. Calculation of orthogonal complements. 6. Geometry exercises and examples. 7. Adjoint operators. | | | |
| 01MAN | Calculus 1 | Z | 4 |
| Basic calculus (real analysis, functions of one real variable, differential calculus). | | | |
| 01MANZ | Calculus 1, exam | ZK | 4 |
| 01MAN2 | Calculus 2 | Z,ZK | 8 |
| 1. Continuation of differential calculus: Taylor´s Polynomials, Taylor´s formula 2. Infinite series: criteria of convergence, operations on series, absolute and conditional convergence 3. Real and complex power series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. Theory of integrals: primitives, definite integral (Riemann definition), techniques of integration and application of integrals, Generalized Riemann integral | | | |
| 02MECH | Mechanics | Z | 4 |
| Introduction to physics, physical quantities and units. Kinematics of a particle, basic types of motion and their superposition. Dynamics of a particle, solving equations of motion for one-dimensional motion, motion in a central force field, forces in non-inertial reference frames. Mechanics of a system of particles, two-body problems, particle collisions. Mechanics of a rigid body, rotation. | | | |
| 02MECHZ | Mechanics - Examination | ZK | 2 |
| The content of the subject is the examination according to the plan of studies. | | | |
| 00PT | Preparatory Week | Z | 2 |
| 02TER | Heat and Molecular Physics | Z,ZK | 4 |
| Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution,equipartition theorem. | | | |
| 16UJRF1 | Introductory Nuclear and Radiation Physics 1 | Z,ZK | 4 |
| The aim of the course is to provide students with basic knowledge about atomic nucleus and radiation physics, which is followed by other specialized lectures. The subject summarizes thematic areas: development of opinions on micro-wave and radiation physics, basic characteristics of the atom and nucleus, binding energy, measurement of mass and dimensions of the nuclei, the most important nuclear models. General characteristics of the interaction of ionizing radiation with the matter, interaction of alpha, beta, gamma and neutron radiation, passage of radiation beams through the matter, radiation effects in matter. | | | |
| 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. | | | |
| 18ZPRO | Basics of Programming | Z | 4 |
| This course is intended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in programming and with the Python programming language. | | | |

Code of the group: BSPJIRZP2
Name of the group: BS P_JIB RŽP 2nd 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:

| **Code** | **Name of the course / Name of the group of courses** ***(in case of groups of courses the list of codes of their members)***<br>*Tutors,* ***authors*** *and guarantors (gar.)* | **Completion** | **Credits** | **Scope** | **Semester** | **Role** |
|---|---|---|---|---|---|---|
| 01ANB3 | **Calculus B 3**<br>*Miroslav Kolář, Milan Krbálek* ***Milan Krbálek*** *Miroslav Kolář (Gar.)* | Z,ZK | 8 | 4P+4C | | PS |

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|---|---|---|---|---|---|---|
| 01ANB4 | **Calculus B 4**<br>*Jiří Mikyška, Miroslav Kolář* ***Jiří Mikyška*** | Z,ZK | 6 | 2P+4C | | PS |
| 12NME1 | **Numerical Methods 1**<br>*Pavel Váchal* ***Pavel Váchal*** *Pavel Váchal (Gar.)* | Z,ZK | 4 | 2+2 | L | PS |
| 16PNZ | **Problems of Non-ionizing Radiation**<br>*Kamil Augsten* ***Kamil Augsten*** *Lenka Thinová (Gar.)* | KZ | 2 | 2P+0C | Z | PS |
| 16PSE | **Topical Dosimetry Seminar**<br>***Kateřina Pilařová*** *Kateřina Pilařová (Gar.)* | Z | 2 | 0P+2C | | PS |
| 18PMTL | **Programming in MATLAB**<br>*Matěj Pokorný, Quang Van Tran, Jaromír Kukal* ***Quang Van Tran*** *Jaromír Kukal (Gar.)* | KZ | 4 | 4C | Z | PS |
| 16ZIVB | **Introduction to Ecology**<br>*Hana Průšová* ***Hana Průšová*** *Hana Průšová (Gar.)* | KZ | 2 | 2+0 | Z | PS |
| 16UJRF2 | **Introductory Nuclear and Radiation Physics 2**<br>*Ladislav Musílek* ***Ladislav Musílek*** *Ladislav Musílek (Gar.)* | Z,ZK | 4 | 2P+2C | Z | PS |
| 02VOAF | **Waves, Optics and Atomic Physics**<br>*Josef Schmidt* ***Jan Vysoký*** *Jiří Tolar (Gar.)* | Z,ZK | 6 | 4+2 | Z | PS |
| 16ZDOZ1 | **Fundamentals of Radiation Dosimetry 1**<br>*Tomáš Trojek* ***Tomáš Trojek*** *Tomáš Trojek (Gar.)* | Z,ZK | 4 | 2+2 | | PS |
| 16ZDOZ2N | **Fundamentals of Radiation Dosimetry 2**<br>*Tomáš Trojek* ***Tomáš Trojek*** *Tomáš Trojek (Gar.)* | Z,ZK | 4 | 2P+2C | L | PS |
| 16ZRIZ | **Health risks of ionizing radiation**<br>*Marie Davídková Marie Davídková (Gar.)* | ZK | 2 | 2P+0C | L | PS |

**Characteristics of the courses of this group of Study Plan: Code=BSPJIRZP2 Name=BS P_JIB RŽP 2nd year**

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|---|---|---|---|
| 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.

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| 01ANB4 | Calculus B 4 | Z,ZK | 6 |

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

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| 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.

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|---|---|---|---|
| 16PNZ | Problems of Non-ionizing Radiation | KZ | 2 |

Subject is focused on biological effects of non-ionizing radiation and its use in physical praxis. Information about principles, biological effects and methods used in fields of magnetic resonance and ultrasound as applied in various types of technical or medical equipment are given as well.

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| 16PSE | Topical Dosimetry Seminar | Z | 2 |

The seminary is supposed to motivate the students interest in the field of dosimetry and provide basic information about different applications of ionizing radiation in science, in research and in human life. The lectures are given by students and absolvents of DDAIR, who are currently employed at the department or in various organizations (SÚRO, v.v.i., ÚJF AV ČR v.v.i., ÚJV Řež, ČMI, Hospital Na Homolce, FN v Motole, PTC Czech s.r.o., CERN, Fermilab). The lectures will focus not only on describing research and current topics in the field of dosimetry, but students will also learn more about Bachelor degree thesis topics and thus will learn more about their possible specialization during the studies and afterwards.

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| 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.

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| 16ZIVB | Introduction to Ecology | KZ | 2 |

The subject inform about basic of the ecologic principles, terms and ideas. It covers overview information regarding to particular components of the environment and evaluate economic indicators and sustainable development.

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|---|---|---|---|
| 16UJRF2 | Introductory Nuclear and Radiation Physics 2 | Z,ZK | 4 |

The aim of the course is to provide students with basic knowledge about atomic nucleus and radiation physics, which is followed by other specialized lectures. The subject summarizes thematic areas: general properties of radioactive decay, alpha decay, proton radioactivity, beta decay, gamma emission, natural radioactivity, properties and types of nuclear reactions, nuclear fission, transuranium elements, thermonuclear reaction.

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

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

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|---|---|---|---|
| 16ZDOZ1 | Fundamentals of Radiation Dosimetry 1 | Z,ZK | 4 |

History, development, and objectives of dosimetry. Quantities and units used for description of sources, fields, interactions of ionizing radiation, ionizations, energy transfer and absorption. Fundamentals of the effects of ionizing radiation.

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|---|---|---|---|
| 16ZDOZ2N | Fundamentals of Radiation Dosimetry 2 | Z,ZK | 4 |

Fundamentals of biological effects of ionizing radiation. Quantities and units used in radiation protection. Recommendations of ICRP and ICRU. Principles and methods of measurements in dosimetry. Determination of activity and neutron source emission. Measurements of absorbed dose and exposure.

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| 16ZRIZ | Health risks of ionizing radiation | ZK | 2 |

The aim of the course is to acquaint students with the radiobiological basics of radiation protection. The basis of the course is an introduction to the biological effects of ionizing radiation (IR) at the molecular, cellular and tissue levels, an overview of deterministic and stochastic effects of ionizing radiation, health harm, risk and its evaluation, basics of epidemiology.

Code of the group: BSPJIRZP3
Name of the group: BS P_JIB RŽP 3rd 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:

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 17BPJI1 | **Bachelor Thesis 1** *Tomáš Trojek, Dušan Kobylka, Jan Rataj Jan Rataj (Gar.)* | Z | 5 | 5ZP | | PS |
| 17BPJI2 | **Bachelor Thesis 2** *Tomáš Trojek, Dušan Kobylka, Jan Rataj Jan Rataj (Gar.)* | Z | 10 | 10ZP | | PS |
| 16DETE | **Detectors of Ionizing Radiation** *Petr Průša* ***Petr Průša*** *Petr Průša (Gar.)* | ZK | 4 | 4+0 | 6 | PS |
| 16EXK | **Excursion** *Lenka Thinová* ***Lenka Thinová*** *Lenka Thinová (Gar.)* | Z | 2 | 1t | 2 | PS |
| 17JARE | **Nuclear Reactors** *Tomáš Bílý* ***Tomáš Bílý*** *Tomáš Bílý (Gar.)* | ZK | 2 | 2 | L | PS |
| 16OSE | **Professional Seminar** ***Kateřina Pilařová*** *Kateřina Pilařová (Gar.)* | Z | 3 | 0P+4C | | PS |
| 16PADR | **Practical Analysis of Data and Risks** *Kateřina Pilařová, Václav Štěpán* ***Václav Štěpán*** *Václav Štěpán (Gar.)* | KZ | 4 | 1P+3C | Z | PS |
| 01PRST | **Probability and Statistics** *Tomáš Hobza* ***Tomáš Hobza*** *Tomáš Hobza (Gar.)* | Z,ZK | 4 | 3+1 | Z | PS |
| 16UAZB | **Principles of Ionizing-Radiation Applications** *Ladislav Musílek* ***Kamil Augsten*** *Ladislav Musílek (Gar.)* | ZK | 2 | 2+0 | Z | PS |
| 16RAON | **Radiation Protection** *Tomáš Trojek, Darina Trojková, Jiří Hůlka, Ladislav Tomášek, Jiří Martinčík* ***Jiří Martinčík*** *Tomáš Trojek (Gar.)* | ZK | 4 | 4+0 | Z | PS |
| 16RAZP | **Radioactivity in the Environment** *Lenka Thinová* ***Lenka Thinová*** *Lenka Thinová (Gar.)* | Z,ZK | 3 | 2P+1C | 2 | PS |
| 12UPF1 | **Introduction to Computational Physics 1** *Milan Kuchařík, Richard Liska* ***Milan Kuchařík*** *Milan Kuchařík (Gar.)* | Z,ZK | 2 | 1P+1C | Z | PS |
| 12UPF2 | **Introduction to Computational Physics 2** *Milan Kuchařík, Richard Liska* ***Milan Kuchařík*** *Milan Kuchařík (Gar.)* | Z,ZK | 2 | 1P+1C | L | PS |
| 16ZPRD | **Elementary Labs** *Petr Průša, Pavel Novotný* ***Petr Průša*** *Pavel Novotný (Gar.)* | KZ | 3 | 3L | | PS |

**Characteristics of the courses of this group of Study Plan: Code=BSPJIRZP3 Name=BS P_JIB RŽP 3rd year**

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|---|---|---|---|
| 17BPJI1 | Bachelor Thesis 1 | Z | 5 |

Student on the basis of theses assignment and under leading of a supervisor individually processes given topic during 2 semesters. The subject is given by self-reliant work on given topic. The work is continuously check by a supervisor.

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|---|---|---|---|
| 17BPJI2 | Bachelor Thesis 2 | Z | 10 |

Student on the basis of theses assignment and under leading of a supervisor individually processes given topic during 2 semesters. The subject is given by self-reliant work on given topic. The work is continuously check by a supervisor.

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| 16DETE | Detectors of Ionizing Radiation | ZK | 4 |

Gas filled detectors (ionization chambers, proportional counters, Geiger-Müller counters, corona counters), organic and inorganic scintillation detectors, Cherenkov counters, evaluation of light by photomultiplier, parameters of PMT, semiconductor detectors, cryogenic detectors.

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| 16EXK | Excursion | Z | 2 |

Excursion in research institutes, laboratories and cooperative universities(CERN, JINR, TU Dresden,...) and modern research trends usig ionizing radiation.

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| 17JARE | Nuclear Reactors | ZK | 2 |

Introduction. World power issue. Previous evolution of power reactor. Nuclear fission reactors, fuel assemblies, active core, control systems, safety systems, containment. Classification of reactors into IV generations. Standard types of nuclear power reactors: concept, description, layout, previous evolution, world share, perspectives. Pressurized water reactors (PWR). Western-type PWR (Westinghouse, KWU, Framatom). VVER-type reactors , Temelín nuclear power plant. Boiling water reactors. Heavy water reactors, fast breeder reactors, high-temperature gas cooled reactors. Second nuclear era. reactors of generation III (EPR, AP-1000, VVER 1200). Reactors of generation IV: GIF and INPRO initiatives. Evaluation and selection of proposed systems. Six selected concepts. ICRP scenarios of word evolution, hydrogen power, role of nuclear power in long-term outlook

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| 16OSE | Professional Seminar | Z | 3 |

In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelors degree projects at the faculty. The second part is designed as a practical training for the defence of the bachelors degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the students performance. Third part of the seminar deals with topical questions on nuclear and radiation physics, dosimetry, detectors of ionizing radiation, and radiation protection with focus on bachelor state final exams. Ph.D. students and academic staff lead this topical discussion with students about given questions and tries to help the students to accommodate learned knowledge form their studies in complex frame for application in practice.

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| 16PADR | Practical Analysis of Data and Risks | KZ | 4 |

The aim of the course is to provide students with a summary of basic theoretical knowledge, especially in the field of probability and statistics, useful for data and risk analysis. The main content of the course is practical application of theoretical procedures, especially data analysis using available software solution. Students will learn to perform comprehensive analysis and evaluation of data and risks.

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| 01PRST | Probability and Statistics | Z,ZK | 4 |

It is a basic course of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolmogorov definition. The notions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and proved. On the basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained.

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| 16UAZB | Principles of Ionizing-Radiation Applications | ZK | 2 |
| Historical outline of applications, review of interaction of radiation with a matter, radiation sources, detectors and instrumentation, evaluation of radionuclide measurements, use of penetration and scattering of radiation beams, selected radioanalytical methods, tracer methods, radionuclide dating, further possibilities for the use of ionizing radiation. | | | |
| 16RAON | Radiation Protection | ZK | 4 |
| The course covers the basic principles of radiation protection. It describes not only the current approaches but also points to future developments. The course is accepted as training, which allows obtaining special competence in radiation protection and learner receives appropriate certificate. | | | |
| 16RAZP | Radioactivity in the Environment | Z,ZK | 3 |
| The course provides a comprehensive view of the source of ionizing radiation occurring in the environment. | | | |
| 12UPF1 | Introduction to Computational Physics 1 | Z,ZK | 2 |
| Numerical simulation and its role in physics, methodology of writing computer codes. Computer languages for physics. Numerical libraries and program libraries for physics. Computer tools for scientific visualization. Computational fluid dynamics, hydrodynamic simulations, methods for discretization of Euler equations. High-performance computing, parallel computing, software for parallel simulations. Databases of scientific information, scientist evaluation, citation analysis. | | | |
| 12UPF2 | Introduction to Computational Physics 2 | Z,ZK | 2 |
| Nonlinear models, complex systems, chaotic systems, fractals and their applications in physics. Artificial intelligence methods: neural networks, machine learning, genetic algorithms, expert systems and their applications in physics. Quantum computing. Virtual reality. | | | |
| 16ZPRD | Elementary Labs | KZ | 3 |
| The aim of the course is to acquaint students with applications of ionizing radiation detectors and also with the principles of detection and spectrometry of ionizing radiation. Ionizing radiation detectors in this course is considered as a device which produces an evaluable signal at the time of interaction (unlike dosimeters). The aim of the course is to understand to basic principles of detection and calibration of common instruments in the field of ionizing radiation measurement. | | | |

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 0
The role of the block: PV

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

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 00EKOT | **Economy in Technology** ***Jana Kovářová*** | Z | 1 | 2+0 | | PV |
| 00ETV | **Ethics of Science and Technology** *Jakub Hajíček* ***Jana Kovářová*** | Z | 1 | 0+2 | L | PV |
| 00RET | **Rhetoric** *Jana Kovářová* ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 1 | 0+2 | | PV |
| 00UPRA | **Introduction to Law** *Martin Čech* ***Jana Kovářová*** | Z | 1 | 0+2 | | PV |
| 00UPSY | **Introduction to Psychology** *Jakub Hajíček* ***Jana Kovářová*** | Z | 1 | 0+2 | | PV |

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

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

Code of the group: BSPJAZYKYZK
Name of the group: BS P languages
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 2 courses
Credits in the group: 0
Note on the group:

| Code | Name of the course / Name of the group of courses<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 |
|---|---|---|---|---|---|---|
| 04XAMZK | **English for Intermediate Students Examination**<br>*Jana Kovářová, Slavěna Brownová* ***Jana Kovářová*** | ZK | 4 | | Z | PV |
| 04XAPZK | **English for Advanced Students Examination**<br>*Slavěna Brownová, Darren Copeland* ***Jana Kovářová*** | ZK | 4 | | Z | PV |
| 04XCESZZK | **Czech for Foreigners Beginners - Examination**<br>*Slavěna Brownová* ***Jana Kovářová*** *Jana Kovářová (Gar.)* | ZK | 4 | | Z | PV |
| 04XCESMZK | **Czech for Intermediate Students Examination**<br>*Jana Kovářová* ***Jana Kovářová*** *Jana Kovářová (Gar.)* | ZK | 4 | | Z | PV |
| 04XCESPZK | **Czech for Foreign Students - Advanced Examination**<br>*Jana Kovářová* ***Jana Kovářová*** *Jana Kovářová (Gar.)* | ZK | 4 | | Z | PV |
| 04XFMZK | **French for Intermediate Students Examination**<br>*Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | ZK | 4 | | Z | PV |
| 04XFPZK | **French for Advanced Students Examination**<br>*Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | ZK | 4 | | Z | PV |
| 04XFZZK | **French for Beginners Examination**<br>*Věra Šlechtová* ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | ZK | 3 | | L | PV |
| 04XNMZK | **German for Intermediate Students Examination**<br>*Miloslava Čechová* ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | ZK | 4 | | Z | PV |
| 04XNPZK | **German for Advanced Students Examination**<br>*Miloslava Čechová* ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | ZK | 4 | | Z | PV |
| 04XRMZK | **Russian for Intermediate Students Examination**<br>*Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | ZK | 4 | | Z | PV |
| 04XRPZK | **Russian for Advanced Students Examination**<br>*Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | ZK | 4 | | Z | PV |
| 04XRZZK | **Russian for Beginners Examination**<br>*Zhanna Isaeva* ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | ZK | 3 | | L | PV |
| 04XSMZK | **Spanish for Intermediate Students Examination**<br>*Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)* | ZK | 4 | | Z | PV |
| 04XSPZK | **Spanish for Advanced Students Examination**<br>*Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)* | ZK | 4 | | Z | PV |
| 04XSZZK | **Spanish for Beginners Examination**<br>*Beatriz Vadillo Gonzalo* ***Beatriz Vadillo Gonzalo*** *Beatriz Vadillo Gonzalo (Gar.)* | ZK | 3 | | L | PV |

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

| | | | |
|---|---|---|---|
| 04XAMZK | English for Intermediate Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XAPZK | English for Advanced Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XCESZZK | Czech for Foreigners Beginners - Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XCESMZK | Czech for Intermediate Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XCESPZK | Czech for Foreign Students - Advanced Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XFMZK | French for Intermediate Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XFPZK | French for Advanced Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XFZZK | French for Beginners Examination | ZK | 3 |

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

| | | | |
|---|---|---|---|
| 04XNMZK | German for Intermediate Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XNPZK | German for Advanced Students Examination | ZK | 4 |

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

| | | | |
|---|---|---|---|
| 04XRMZK | Russian for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XRPZK | Russian for Advanced Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XRZZK | Russian for Beginners Examination | ZK | 3 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RZ1 - RZ5. Students are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XSMZK | Spanish for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. 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: BSPJIRZPV
Name of the group: BS P_JIB RŽP Optional courses
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group:

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 17BPROV | **Safe operation of nuclear facilities** *Lenka Frýbortová, Ľubomír Sklenka Lenka Frýbortová (Gar.)* | KZ | 2 | 2P | | v |
| 02DEF2 | **History of Physics 2** *Igor Jex Igor Jex (Gar.)* | Z | 2 | 2+0 | L | v |
| 16EPAM | **Exact Methods in Research of Historic Monuments** *Ladislav Musílek* ***Ladislav Musílek*** *Ladislav Musílek (Gar.)* | ZK | 2 | 2+0 | Z | v |
| 17ENEF | **Experimental Neutron Physics** *Jan Rataj Jan Rataj (Gar.)* | KZ | 3 | 1P+2L | L | v |
| 16KPR | **Clinical Propaedeutic** *Jana Votrubová* ***Jana Votrubová*** *Jana Votrubová (Gar.)* | ZK | 2 | 2+0 | Z | v |
| 04AKS | **English Conversation** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 1 | 0+2 | L | v |
| 00MAM1 | **Essentials of High School Course 1** *David Břeň* | Z | 1 | 0+1 | | v |
| 00MAM2 | **Essentials of High School Math Course 2** *Lukáš Heriban* ***Severin Pošta*** *Lukáš Heriban (Gar.)* | Z | 1 | 0+1 | | v |
| 01NME2 | **Numerical Methods 2** *Michal Beneš* ***Michal Beneš*** *Michal Beneš (Gar.)* | KZ | 2 | 2+0 | L | v |
| 15CH1 | **General Chemistry 1** *Ondřej Holas, Petr Distler, Václav Čuba* ***Petr Distler*** *Petr Distler (Gar.)* | Z | 3 | 2+1 | Z | v |
| 15CH2 | **General Chemistry 2** *Ondřej Holas, Petr Distler, Václav Čuba* ***Petr Distler*** *Petr Distler (Gar.)* | Z,ZK | 3 | 2+1 | L | v |
| 18PRC1 | **Programming in C++ 1** *Vladimír Jarý, Miroslav Virius* ***Miroslav Virius*** *Miroslav Virius (Gar.)* | Z | 4 | 2+2 | Z | v |
| 18PRC2 | **Programming in C++ 2** *Vladimír Jarý, Miroslav Virius, Jakub Klinkovský* ***Miroslav Virius*** *Miroslav Virius (Gar.)* | KZ | 4 | 2+2 | L | v |
| 01PSL | **LaTeX - Publication Instrument** *Petr Ambrož* ***Petr Ambrož*** *Petr Ambrož (Gar.)* | Z | 2 | 0+2 | L | v |
| 01RMAF | **Equations of Mathematical Physics** *Václav Klika* ***Václav Klika*** *Václav Klika (Gar.)* | Z,ZK | 7 | 4P+2C | | v |
| 01STME | **Statistical Methods with Applications** *Tomáš Hobza* ***Tomáš Hobza*** *Tomáš Hobza (Gar.)* | ZK | 2 | 2P+0C | | v |
| TV-1 | **Physical Education** | Z | 1 | | Z | v |
| TV-2 | **Physical Education** | Z | 1 | | L | v |
| TV-3 | **Physical education** | Z | 1 | 0+2 | Z | v |

| | | | | | | |
|---|---|---|---|---|---|---|
| TV-4 | **Physical education** | Z | 1 | 0+2 | L | v |
| 02TEF1 | **Theoretical Physics 1**<br>*Petr Novotný **Michal Jex** Igor Jex (Gar.)* | Z,ZK | 4 | 2+2 | Z | v |
| 02TSFA | **Thermodynamics and Statistical Physics**<br>*Igor Jex, Jaroslav Novotný **Antonín Hoskovec** Igor Jex (Gar.)* | Z,ZK | 4 | 2+2 | L | v |
| 02UFEC | **Introduction to Elementary Particle Physics**<br>*Marek Matas, Jaroslav Bielčík **Jaroslav Bielčík** Jaroslav Bielčík (Gar.)* | Z | 2 | 2+0 | Z | v |
| 17UING | **Introduction to Engineering**<br>*Jan Frýbort, Petr Haušild, Radek Mušálek Jan Frýbort (Gar.)* | KZ | 3 | 2P+1C | Z | v |
| 12UNXAP | **Introduction to UNIX**<br>*Milan Kuchařík **Milan Kuchařík** Milan Kuchařík (Gar.)* | Z | 2 | 1P+1C | L | v |
| 12UVP | **Introduction to Scientific Computing**<br>*Milan Šiňor **Milan Šiňor** Milan Šiňor (Gar.)* | Z | 2 | 1P+1C | L | v |
| 16UVJZ | **Introduction to Decommissioning of Nuclear Facilities**<br>*Lenka Thinová, Tomáš Trojek **Lenka Thinová** Lenka Thinová (Gar.)* | Z,ZK | 4 | 3P+1C | L | v |
| 18ZALG | **Basics of Algorithmization**<br>*Vladimír Jarý, Miroslav Virius, Petr Pauš, František Voldřich, Jan Tomsa, Zuzana Petříčková, František Gašpar **Vladimír Jarý** Miroslav Virius (Gar.)* | Z,ZK | 4 | 2+2 | L | v |
| 12ZEL1 | **Basic Electronics 1**<br>*Jaroslav Pavel **Jaroslav Pavel** Jaroslav Pavel (Gar.)* | Z,ZK | 3 | 2+1 | Z | v |
| 12ZEL2 | **Basic Electronics 2**<br>*Jaroslav Pavel **Jaroslav Pavel** Jaroslav Pavel (Gar.)* | Z,ZK | 3 | 2+1 | L | v |
| 16ZPSP | **Basic Work with PC**<br>***Kamil Augsten** Kamil Augsten (Gar.)* | Z | 2 | 0+2 | 1 | v |
| 16ZRAO | **Basics of Radiation Protection**<br>*Aneta Smejkalová **Aneta Smejkalová** Aneta Smejkalová (Gar.)* | Z | 2 | 2+0 | | v |
| 16ZOZ | **Sources of Irradiation and Environment**<br>*Ladislav Musílek, Ondřej Kořistka, Lenka Thinová, Václav Štěpán, Tomáš Urban, Tomáš Čechák **Václav Štěpán** Václav Štěpán (Gar.)* | KZ | 4 | 2P+2C | L | v |

**Characteristics of the courses of this group of Study Plan: Code=BSPJIRZPV Name=BS P_JIB RŽP Optional courses**

| | | | |
|---|---|---|---|
| 17BPROV | Safe operation of nuclear facilities | KZ | 2 |
| The aim of the subject is to familiarize students with basic principles of nuclear safety. | | | |
| 02DEF2 | History of Physics 2 | Z | 2 |
| Development of classical mechanics after Newton, Bernoulli's, Euler, Lagrange. Historical development of optics, corpuscular and wave approach. Electricity and magnetism - electrostatics, galvanism, electrodynamics and electromagnetism, Faraday and Maxwell. Thermodynamics and its laws, statistical physics, Boltzmann. The birth of modern quantum and relativistic physics, Planck and Einstein. Discovery of radioaktivity, structure of atom, atomic nucleus, Rutherford and Bohr. The way to nuclear energy, Elementary particles, standard model. The concept of Nature and Universe of today. | | | |
| 16EPAM | Exact Methods in Research of Historic Monuments | ZK | 2 |
| Aims and methods of historic monument investigations, methods of age determination (radiocarbon, thermoluminescence and related methods, further radiation methods, dendrochronology, archaeomagnetism), analytical methods for determination of origin and production technologies of artefacts (activation analysis, X-ray fluorescence analysis and other methods), photogrammetry. | | | |
| 17ENEF | Experimental Neutron Physics | KZ | 3 |
| The course is focused on experimental methods and experiments in the field of neutron physics, mainly using radionuclide neutron sources. The lectures are devoted to the theoretical bases necessary for preparation and realization of the laboratory exercises and to the methods of experimental data processing and evaluation. Specifically, the lectures provide detailed description of neutron properties and their utilization, the characteristics of neutron sources, properties of prompt and delayed neutrons, selected methods of neutron detection, neutron transport in substances, production, formation and modification of neutron fields and neutron beams. The lectures are complemented by the laboratory exercises in the field of neutron detection, measurement of delayed neutrons, study of neutron transport in various substances, experiments with various neutron sources (252Cf, AmBe, D-D neutron generator), preparation and detection of photo-neutron source, calibration of the radionuclide neutron source. The experiments are realized at the VR-1 training reactor and its laboratories. | | | |
| 16KPR | Clinical Propaedeutic | ZK | 2 |
| Making students familiar with the basics of anamnesis, physical examination, examinational methods of different organs, hematological and biochemical examinations and anaesthesia | | | |
| 04AKS | English Conversation | Z | 1 |
| The course will develop the student´s communication skills acquired throughout their previous studies. It aims to improve all aspects of oral communication. The student will develop their vocabulary for various communication situations and will master their communication strategy. They will also practise their listening skills in order to better follow and participate in discussions. The student will be trained to express their ideas clearly and according to current English usage, and become a more confident speaker. | | | |
| 00MAM1 | Essentials of High School Course 1 | Z | 1 |
| Students are introduced to mathematical concepts and methods used in the introductory physics course. | | | |
| 00MAM2 | Essentials of High School Math Course 2 | Z | 1 |
| Review of basics of high school mathematics. | | | |
| 01NME2 | Numerical Methods 2 | KZ | 2 |
| The course is devoted to numerical solution of boundary-value problems and intial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations. | | | |
| 15CH1 | General Chemistry 1 | Z | 3 |
| The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises. | | | |
| 15CH2 | General Chemistry 2 | Z,ZK | 3 |
| The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises. | | | |
| 18PRC1 | Programming in C++ 1 | Z | 4 |
| This course covers mainly the C programming language and non-object oriented features of the C++ language. | | | |
| 18PRC2 | Programming in C++ 2 | KZ | 4 |
| This course covers the object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Template Library. | | | |

| | | | |
|---|---|---|---|
| 01PSL | LaTeX - Publication Instrument | Z | 2 |
| The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX | | | |
| 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 eliptic PDE, mixed boundary problem for eliptic PDE). | | | |
| 01STME | Statistical Methods with Applications | ZK | 2 |
| The course consists of selected methods of statistical data analysis such as: linear regression and correlation, analysis of variance, nonparametric methods, contingency tables, and their application. The aim is to illustrate the use of statistical procedures on examples. Solutions of concrete examples by use of statistical software are also included. | | | |
| TV-1 | Physical Education | Z | 1 |
| TV-2 | Physical Education | Z | 1 |
| TV-3 | Physical education | Z | 1 |
| TV-4 | Physical education | Z | 1 |
| 02TEF1 | Theoretical Physics 1 | Z,ZK | 4 |
| The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalisms as well as diferent approaches to description of dynamics (Newtons, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2). | | | |
| 02TSFA | Thermodynamics and Statistical Physics | Z,ZK | 4 |
| Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect,conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is usedto discusses simple transport phenomena. | | | |
| 02UFEC | Introduction to Elementary Particle Physics | Z | 2 |
| The course provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the subject are presented. | | | |
| 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. | | | |
| 12UNXAP | Introduction to UNIX | Z | 2 |
| Computer and operating systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interface. Hardware and software. Principles of operating systems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working with files. Text editors: vi, emacs. Command interpreter (shell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard tools. Graphical user interface X-windows. Computer networks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications | | | |
| 12UVP | Introduction to Scientific Computing | Z | 2 |
| Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom.Students get acquinted with some basic tools fort scientific and technicval computing, data analysis, data visualisation and algorithm development. | | | |
| 16UVJZ | Introduction to Decommissioning of Nuclear Facilities | Z,ZK | 4 |
| The course aims to familiarise students with the actual decommissioning process. The syllabus of the subject is built in the sense of the actual course of the preparation and realization of the decommissioning project. It includes implementation of site decommissioning including legislative requirements to protect employees and the environment against radiation and waste management in their categorization, transport, release to the environment and disposal. It deals with documentation and centralization of monitoring systems. | | | |
| 18ZALG | Basics of Algorithmization | Z,ZK | 4 |
| This course is devoted to selected algorithms and methods for algorithm design. This course intruduces selected methods for the determination of the algorithm complexity. | | | |
| 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. | | | |
| 16ZPSP | Basic Work with PC | Z | 2 |
| The aim of the course is to acquaint students with the basic skills related to working on a personal computer. The introductory part of the course is devoted to information systems and resources available at the CTU in Prague and the FNSPE. Emphasis is placed on effective handling of work with office productivity software (text editor, spreadsheet and presentation software) with exercises in MS Office. The practical content focuses mainly on further use during studies (laboratory reports, research work, bachelor's and diploma theses) and in specific practice (hospitals, state administration, companies). Other sections summarize basic information about computer hardware, software, and security. Completion of independent home exercises and participation in exercises above 60% is a necessary condition for passing the course. | | | |
| 16ZRAO | Basics of Radiation Protection | Z | 2 |
| The aim of the course is to familiarize students with the general principles of radiation protection. The main emphasis is put on basic mechanisms and concepts, in order to allow critical orientation in this field. The course provides answers to the cardinal questions: What is ionizing radiation (IR), where it comes from, whether and how it is dangerous for people, what is the meaning of protective units (Gray, Sievert), how to prevent malicious effect of IR and many others. The content of the lectures does not require any prior knowledge. | | | |
| 16ZOZ | Sources of Irradiation and Environment | KZ | 4 |
| The subject provides an overview of the usage of ionizing radiation from its discovery and first applications to modern methods. It allows the student to acquire the basic knowledge about ionizing radiation usage. The subject deals with the fundamental issues related to ionizing radiation and the safety of dealing with the sources of IR. The course includes practical exercises with processing the data and subsequent presentation of the results. | | | |

Code of the group: BSPJAZYKYZAP
Name of the group: BS P jazyky zap
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group:

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 04XAM1 | **English for Intermediate Students M1** ***Jana Kovářová*** | Z | 2 | 0+2 | Z | v |
| 04XAM2 | **English for Intermediate Students M2** ***Jana Kovářová*** | Z | 2 | 0+2 | L | v |
| 04XAM3 | **English for Intermediate Students M3** ***Jana Kovářová*** | Z | 2 | 0+2 | Z | v |
| 04XAP1 | **English for Advanced Students P1** ***Jana Kovářová*** | Z | 2 | 0+2 | Z | v |
| 04XAP2 | **English for Advanced Students P2** ***Jana Kovářová*** | Z | 2 | 0+2 | L | v |
| 04XAP3 | **English for Advanced Students P3** ***Jana Kovářová*** | Z | 2 | 0+2 | Z | v |
| 04XCESZ1 | **Czech for Foreigners - Beginners 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XCESZ2 | **Czech for Foreigners - Beginners 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XCESZ3 | **Czech for Foreigners - Beginners 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 2S | Z | v |
| 04XCESM1 | **Czech for Foreigners - Intermediate 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XCESM2 | **Czech for Foreigners - Intermediate 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XCESM3 | **Czech for Foreigners - Intermediate 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XCESP1 | **Czech for Foreign Students - Advanced 1** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XCESP2 | **Czech for Foreigners - Advanced 2** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XCESP3 | **Czech for Foreigners - Advanced 3** ***Jana Kovářová*** *Jana Kovářová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XFM1 | **French for Intermediate Students M1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XFM2 | **French for Intermediate Students M2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XFM3 | **French for Intermediate Students M3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XFP1 | **French for Advanced Students P1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XFP2 | **French for Advanced Students P2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XFP3 | **French for Advanded Students P3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XFZ1 | **French for Beginners Z1** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+4 | L | v |
| 04XFZ2 | **French for Beginners Z2** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+4 | Z | v |
| 04XFZ3 | **French for Beginners Z3** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+4 | L | v |
| 04XFZ4 | **French for Beginners Z4** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+4 | Z | v |
| 04XFZ5 | **French for Beginners Z5** ***Věra Šlechtová*** *Věra Šlechtová (Gar.)* | Z | 2 | 0+4 | L | v |
| 04XNM2 | **German for Intermediate Students M2** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XNM1 | **German for Intermediate Students M1** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XNM3 | **German for Intermediate Students M3** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XNP1 | **German for Advanced Students P1** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XNP2 | **German for Advanced Students P2** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XNP3 | **German for Advanced Students P3** ***Miloslava Čechová*** *Miloslava Čechová (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XRM1 | **Russian for Intermediate Students M1** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XRM2 | **Russian for Intermediate Students M2** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | Z | 2 | 0+2 | L | v |
| 04XRM3 | **Russian for Intermediate Students M3** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | Z | 2 | 0+2 | Z | v |
| 04XRP1 | **Russian for Advanced Students P1** ***Zhanna Isaeva*** *Zhanna Isaeva (Gar.)* | Z | 2 | 0+2 | Z | v |

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

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

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|---|---|---|---|
| 04XAM1 | English for Intermediate Students M1 | Z | 2 |

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

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| 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.

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| 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.

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| 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.

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| 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.

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| 04XAP3 | English for Advanced Students P3 | Z | 2 |

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

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| 04XCESZ1 | Czech for Foreigners - Beginners 1 | Z | 2 |

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

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| 04XCESZ2 | Czech for Foreigners - Beginners 2 | Z | 2 |
| The language and communication competences acquired in CESZ1 are further developed. Students deepen their knowledge of the declension and conjugation system and practise basic communication topics. The course covers roughly lessons 3-5 in Czech Express by L. Holá and P. Bořilová. | | | |
| 04XCESZ3 | Czech for Foreigners - Beginners 3 | Z | 2 |
| The course further develops the language and communication competences acquired in the XCESZ1 and XCESZ2 courses. The teaching focuses on building up basic vocabulary, fixing correct pronunciation and deepening grammar, features through practice, as well as introducing the Czech culture. Students are asked to produce simple texts and they practise frequent types of dialogue. They also practise understanding texts in terms of main ideas or looking for specific details in texts. The course covers roughly lessons 5-7 in Čeština expres 1. | | | |
| 04XCESM1 | Czech for Foreigners - Intermediate 1 | Z | 2 |
| The course is focused on correct pronunciation, important morphological phenomena, prepositional phrases, and verb forms as well as on extending the student´s vocabulary for various social situations. | | | |
| 04XCESM2 | Czech for Foreigners - Intermediate 2 | Z | 2 |
| The course develops the topics covered in CESM1 and is then focused on more difficult grammar phenomena. It practices writing, speaking, and reading skills and trains the student in understanding common abbreviations, abbreviated words, and mathematical terms and formulas. | | | |
| 04XCESM3 | Czech for Foreigners - Intermediate 3 | Z | 2 |
| The last course revises morphological topics covered earlier and extends the student´s knowledge of more difficult language phenomena. It is especially focused on stylistics and lexicology and on developing the student´s writing skills. | | | |
| 04XCESP1 | Czech for Foreign Students - Advanced 1 | Z | 2 |
| The prerequisite of the course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common European Framework of Reference. It is focused partly on revision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of science. Students are taught the basics of functional style of engineering and professional communication, both in spoken and written form. The topics include University Studies and Student Life. Written practice includes communication with teachers and faculty administrators. | | | |
| 04XCESP2 | Czech for Foreigners - Advanced 2 | Z | 2 |
| This course extends the student´s knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical and specialist texts placing greater emphasis on individual work. | | | |
| 04XCESP3 | Czech for Foreigners - Advanced 3 | Z | 2 |
| The course develops the student´s knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation, and, finally, presentation of the student´s project. Writing skills necessary for professional communication are trained. | | | |
| 04XFM1 | French for Intermediate Students M1 | Z | 2 |
| French - intermediate FM The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and professional environment. They will be able to use the language to transmit general and technical information and to solve problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, systemizes and expands language skills gained in previous study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these texts. | | | |
| 04XFM2 | French for Intermediate Students M2 | Z | 2 |
| Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material. | | | |
| 04XFM3 | French for Intermediate Students M3 | Z | 2 |
| The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students´ future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one´s own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence. | | | |
| 04XFP1 | French for Advanced Students P1 | Z | 2 |
| FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-imparfait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topics of specialization: mathematics, internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation. | | | |
| 04XFP2 | French for Advanced Students P2 | Z | 2 |
| With the link to P1 contents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication on given topics. Features typical of technical and scientific communication are stressed (passive voice, nominalization, word formation). | | | |
| 04XFP3 | French for Advanded Students P3 | Z | 2 |
| The course is focused on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in engineering environment. Special skill - translation of shorter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covers a technical /applied science topic. It is a creative work compiled from 3 French sources. Preparation of several set topics for oral examination. | | | |
| 04XFZ1 | French for Beginners Z1 | Z | 2 |
| French for beginners The objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life , in socializing and in professional life. The course includes French for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able to communicate at elementary level, actively using the knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdová, French for beginners (Francouzština pro začátečky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar. | | | |
| 04XFZ2 | French for Beginners Z2 | Z | 2 |
| The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty. | | | |
| 04XFZ3 | French for Beginners Z3 | Z | 2 |
| The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts. | | | |

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| 04XFZ4 | French for Beginners Z4 | Z | 2 |
| The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet. | | | |
| 04XFZ5 | French for Beginners Z5 | Z | 2 |
| All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive. | | | |
| 04XNM2 | German for Intermediate Students M2 | Z | 2 |
| The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses). | | | |
| 04XNM1 | German for Intermediate Students M1 | Z | 2 |
| The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability. | | | |
| 04XNM3 | German for Intermediate Students M3 | Z | 2 |
| The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses). | | | |
| 04XNP1 | German for Advanced Students P1 | Z | 2 |
| This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning. | | | |
| 04XNP2 | German for Advanced Students P2 | Z | 2 |
| The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech). | | | |
| 04XNP3 | German for Advanced Students P3 | Z | 2 |
| The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German. | | | |
| 04XRM1 | Russian for Intermediate Students M1 | Z | 2 |
| The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable. | | | |
| 04XRM2 | Russian for Intermediate Students M2 | Z | 2 |
| The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable. | | | |
| 04XRM3 | Russian for Intermediate Students M3 | Z | 2 |
| The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable. | | | |
| 04XRP1 | Russian for Advanced Students P1 | Z | 2 |
| The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills. | | | |
| 04XRP2 | Russian for Advanced Students P2 | Z | 2 |
| The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication. | | | |
| 04XRP3 | Russian for Advanced Students P3 | Z | 2 |
| The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics. | | | |
| 04XRZ1 | Russian for Beginners Z1 | Z | 2 |
| The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it. | | | |
| 04XRZ2 | Russian for Beginners Z2 | Z | 2 |
| The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing. | | | |

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| 04XRZ3 | Russian for Beginners Z3 | Z | 2 |
| The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking. | | | |
| 04XRZ4 | Russian for Beginners Z4 | Z | 2 |
| The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals. | | | |
| 04XRZ5 | Russian for Beginners Z5 | Z | 2 |
| The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.) | | | |
| 04XSM1 | Spanish for Intermediate Students M1 | Z | 2 |
| The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them. | | | |
| 04XSM2 | Spanish for Intermediate Students M3 | Z | 2 |
| The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet. | | | |
| 04XSM3 | Spanish for Intermediate Students M3 | Z | 2 |
| The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination. | | | |
| 04XSP1 | Spanish for Advanced Students P1 | Z | 2 |
| Course concentrates on more difficult grammar topics, revision of vocabulary, basics of Spanish for specific purposes as well as written communication. Course prerequisites: level B2 of CEFR. | | | |
| 04XSP2 | Spanish for Advanced Students P2 | Z | 2 |
| Course SP2 is the second part of the advanced Spanish course, extending Spanish for specific purposes topics. It comprises more grammar and syntax and focuses on independent written communication. | | | |
| 04XSP3 | Spanish for Advanced Students P3 | Z | 2 |
| Course SP3 is the final part of the advanced Spanish course. It is based on texts chosen by the students according to their future specialization. It is focused on written communication based on what students will need in their career. | | | |
| 04XSZ1 | Spanish for Beginners Z1 | Z | 2 |
| Course SZ1 is the first stage of the five-semester programme of Spanish studies; during the first stage the students will master phonetics and fundamental grammar structures and will be able to communicate at an elementary level on topics of everyday life. They will acquire and extend fundamental vocabulary of general Spanish and will develop it. | | | |
| 04XSZ2 | Spanish for Beginners Students Z2 | Z | 2 |
| Course SZ2 is based on course SZ1, and expects students to develop and extend the knowledge and skills acquired so far. Grammar structures and lexis will be chosen so as to enable them to understand short adapted written texts and speech. Attention is also paid to cultural differences between Spanish-speaking countries and others such as the Czech Republic. Realia of Spanish-speaking countries are also included. | | | |
| 04XSZ3 | Spanish for Beginners Z3 | Z | 2 |
| The course is based on course SZ2, and develops the student´s vocabulary and grammar structure. The course covers realia (history and culture) of the Spanish-speaking countries, mainly of Spain. It pays attention to further grammar topics (pretérito perfecto, pretérito indefinido, pretérito imperfecto, the gerund and the imperative). It includes written and oral communication on a given general topic, for which the student is trained by reading texts or listening to them. | | | |
| 04XSZ4 | Spanish for Beginners Z4 | Z | 2 |
| The course is based on course SZ3. It develops the student´s vocabulary and extends the knowledge of the culture and social customs of the Spanish speaking countries, mainly of Spain. It pays attention to further grammar topics (perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given general or subtechnical topic, for which the student is trained by reading texts or listening to them. | | | |
| 04XSZ5 | Spanish for Beginners Z5 | Z | 2 |
| The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with peculiarities of Spanish for specific purposes. In its final part, the general Spanish course based on the course book will end with presentations and, finally, a written and oral examination. | | | |

## List of courses of this pass:

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

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| 00RET | Rhetoric | Z | 1 |
| The course is focused on the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the composition of public speech as well as to its nonverbal aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an integral part of the course. | | | |
| 00UPRA | Introduction to Law | Z | 1 |
| 00UPSY | Introduction to Psychology | Z | 1 |
| 01ANB3 | Calculus B 3 | Z,ZK | 8 |
| 1. Functional sequences and series - convergence range, criteria of uniform convergence, continuity, limit, differentiation and integration of functional series, power series, Series Expansion, Taylor´s theorem. 2. Ordinary differential equations - equations of first order (method of integration factor, equation of Bernoulli, separation of variables, homogeneous equation and exact equation) and equations of higher order (fundamental system, reduction of order, variation of parameters, equations with constant coefficients and special right-hand side, Euler differential equation). 3. Metric spaces - metric, norm, scalar product, neighborhood, interior and exterior points, boundary point, isolated and non-isolated point, boundary of set, completeness of space, Hilbert spaces. Orthogonal polynomials. Complete orthogonal systems. 4. Fourier series - expansion of functions into Fourier series, trigonometric Fourier series and their convergence. 5. Differential calculus of functions of several variables - limit, continuity, partial and directional derivative, gradient, total derivatives and tangent plane, Taylor series, elementary terms of vector analysis, Jacobi matrix. 6. Functions defined implicitly by one or several equations. | | | |
| 01ANB4 | Calculus B 4 | Z,ZK | 6 |
| [1] Diferenciální počet funkcí více proměnných a funkcionálních vektorů. [2] Funkce zadané implicitně. [3] Taylorovy řady funkce více proměnných. [4] Regulární zobrazení, záměna proměnných, nekartézské soustavy souřadnic. [5] Lokální, vázané a globální extrémy funkce více proměnných. [6] Základy teorie míry a obrys konstrukce Lebesgueovy míry. [7] Integrální počet funkce více proměnných - Riemannův a Lebesgueův integrál, základní vlastnosti, Fubiniova věta, věta o substituci. Leviho a Lebesgueova věta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po křivkách a plochách. Integrální věty. | | | |
| 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 intial-boundary-value problems for ordinary and partial differential equations. It explains methods converting boundary-value problems to initial-value problems and finite-difference methods for elliptic, parabolic and first-order hyperbolic partial differential equations. | | | |
| 01PRST | Probability and Statistics | Z,ZK | 4 |
| It is a basic course of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolmogorov definition. The notions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and proved. On the basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained. | | | |
| 01PSL | LaTeX - Publication Instrument | Z | 2 |
| The course is devoted to the basics and facilities of computer typography, particularly to the system LaTeX | | | |
| 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 eliptic PDE, mixed boundary problem for eliptic PDE). | | | |
| 01STME | Statistical Methods with Applications | ZK | 2 |
| The course consists of selected methods of statistical data analysis such as: linear regression and correlation, analysis of variance, nonparametric methods, contingency tables, and their application. The aim is to illustrate the use of statistical procedures on examples. Solutions of concrete examples by use of statistical software are also included. | | | |
| 02DEF1 | History of Physics 1 | Z | 2 |
| Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Physics in Helenistic period, Archimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kepler, Galileo, Huygens. The birth of physics as experimental science. Newton and his work. | | | |
| 02DEF2 | History of Physics 2 | Z | 2 |
| Development of classical mechanics after Newton, Bernoulli's, Euler, Lagrange. Historical development of optics, corpuscular and wave approach. Electricity and magnetism - electrostatics, galvanism, electrodynamics and electromagnetism, Faraday and Maxwell. Thermodynamics and its laws, statistical physics, Boltzmann. The birth of modern quantum and relativistic physics, Planck and Einstein. Discovery of radioaktivity, structure of atom, atomic nucleus, Rutherford and Bohr. The way to nuclear energy, Elementary particles, standard model. The concept of Nature and Universe of today. | | | |
| 02ELMA | Electricity and Magnetism | Z,ZK | 6 |
| Electric charge, Coulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the relativity theory. Electrodynamic forces, magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, RLC circuits. Electromagnetic waves, Maxwell equations. | | | |
| 02MECH | Mechanics | Z | 4 |
| Introduction to physics, physical quantities and units. Kinematics of a particle, basic types of motion and their superposition. Dynamics of a particle, solving equations of motion for one-dimensional motion, motion in a central force field, forces in non-inertial reference frames. Mechanics of a system of particles, two-body problems, particle collisions. Mechanics of a rigid body, rotation. | | | |
| 02MECHZ | Mechanics - Examination | ZK | 2 |
| The content of the subject is the examination according to the plan of studies. | | | |
| 02TEF1 | Theoretical Physics 1 | Z,ZK | 4 |
| The course is an introduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalisms as well as diferent approaches to description of dynamics (Newtons, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementary examples like the two-body | | | |

problem, the motion of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principles of mechanics. The subject is the first part of the course of classical theoretical physics (02TEF1, 02TEF2).

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| 02TER | Heat and Molecular Physics | Z,ZK | 4 |
| Thermal expansion of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynamic principle, ideal and real gas, entropy; non-chemical systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity distribution,equipartition theorem. | | | |
| 02TSFA | Thermodynamics and Statistical Physics | Z,ZK | 4 |
| Foundation of thermodynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect,conditions of equilibrium, the Braun-Le Chatelier principle. Statistical entropy. Basics of many body descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonical ensemble, Fermi gas, models of crystals and the black body radiation). The Boltzmann equation is usedto discusses simple transport phenomena. | | | |
| 02UFEC | Introduction to Elementary Particle Physics | Z | 2 |
| The course provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the subject are presented. | | | |
| 02VOAF | Waves, Optics and Atomic Physics | Z,ZK | 6 |
| Wave phenomena in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polarization, interference, diffraction, coherence. Geometrical optics. Introduction to quantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves,the Schrodinger equation, stationary states and spectra of finite systems. | | | |
| 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. | | | |
| 04AKS | English Conversation | Z | 1 |
| The course will develop the student´s communication skills acquired throughout their previous studies. It aims to improve all aspects of oral communication. The student will develop their vocabulary for various communication situations and will master their communication strategy. They will also practise their listening skills in order to better follow and participate in discussions. The student will be trained to express their ideas clearly and according to current English usage, and become a more confident speaker. | | | |
| 04XAM1 | English for Intermediate Students M1 | Z | 2 |
| The course is designed for students who have successfully completed the full secondary school English language course at least at the A2 level of the Common European Framework of Reference for Languages (CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into fundamentals of vocabulary and style typical of professional oral and written communication situations. Thus it covers topics related to the student´s life and needs as well as topics of subtechnical interest. Attention is also paid to extending the knowledge of grammar issues used in EAP. | | | |
| 04XAM2 | English for Intermediate Students M2 | Z | 2 |
| The AM2 course expects the student to have completed the AM1 course. It develops their skills for work with subtechnical texts, focusing also more on specific grammar, functions, and lexical items typical of ESP and EAP (e.g., definition, existence and classification of phenomena, object descriptions). Part of the course is also guided writing. If necessary, grammar revision is included. | | | |
| 04XAM3 | English for Intermediate Students M3 | Z | 2 |
| The course develops the skills that enable students to cope with features typical of professional style. Increasing attention is paid to developing subtechnical vocabulary and independent understanding of professional texts. Great emphasis is placed on distinguishing different levels of formal and informal oral and written communication and their appropriate Czech equivalents. The course also includes studying abstracts and rules for writing them as well as basic rules for preparing and giving a short presentation on a chosen topic related to the student´s field. | | | |
| 04XAMZK | English for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The examination covers the AM1, AM2, and AM3 courses and consists of two parts - written (100 min) and oral (20-30 min). The student is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English courses. | | | |
| 04XAP1 | English for Advanced Students P1 | Z | 2 |
| The course is designed for students who have successfully completed the full secondary school English language course (at least the B1 level of the Common European Framework of Reference for Languages - CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into the fundamentals of vocabulary, functions, grammar, and style typical of professional oral and written communication situations (fundamentals of terms in mathematics and physics, definitions, graph descriptions, etc). It also covers professional oral and written communication on topics related to the undergraduate´s life and needs. It develops skills for free professional writing (writing a CV, letter of application, polite request). If necessary, revision of selected grammar topics is included. | | | |
| 04XAP2 | English for Advanced Students P2 | Z | 2 |
| The AP2 course is based on AP1, thus extending the student´s skills for working with subtechnical texts, and even with professional texts of chosen branches of science. According to the students´ needs it concentrates on chosen grammar topics, but mainly intends to develop understanding of syntactic structures and typical rhetorical functions (e.g., various types of descriptions, and, if possible, a case study). Increasing emphasis is placed on the undergraduate´s independent work with and reading of linguistically more demanding materials. The course extends the student´s subtechnical vocabulary, and includes fundamental notions of chosen branches of science. It is focused on formal writing including the sentence and paragraph structure, linking, cohesion and coherence in texts. | | | |
| 04XAP3 | English for Advanced Students P3 | Z | 2 |
| The AP3 course is based on AP2 and expects the student to work without any guidance with authentic professional materials and to interpret the text. It includes training oral and written communication skills and functions (e.g., expressing an opinion, agreement, and objections; taking part in discussion, note-taking; summarizing, writing an abstract) and, if possible, also preparing a project on a given or chosen topic and presenting it. The course places emphasis on distinguishing levels of formal and informal language both in oral and written communication. | | | |
| 04XAPZK | English for Advanced Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (100 min) and oral (30 min) and includes also oral presentation of a topic from the student´s field of study. | | | |
| 04XCESM1 | Czech for Foreigners - Intermediate 1 | Z | 2 |
| The course is focused on correct pronunciation, important morphological phenomena, prepositional phrases, and verb forms as well as on extending the student´s vocabulary for various social situations. | | | |
| 04XCESM2 | Czech for Foreigners - Intermediate 2 | Z | 2 |
| The course develops the topics covered in CESM1 and is then focused on more difficult grammar phenomena. It practices writing, speaking, and reading skills and trains the student in understanding common abbreviations, abbreviated words, and mathematical terms and formulas. | | | |

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| 04XCESM3 | Czech for Foreigners - Intermediate 3 | Z | 2 |
| The last course revises morphological topics covered earlier and extends the student´s knowledge of more difficult language phenomena. It is especially focused on stylistics and lexicology and on developing the student´s writing skills. | | | |
| 04XCESMZK | Czech for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESM1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher. | | | |
| 04XCESP1 | Czech for Foreign Students - Advanced 1 | Z | 2 |
| The prerequisite of the course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common European Framework of Reference. It is focused partly on revision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of science. Students are taught the basics of functional style of engineering and professional communication, both in spoken and written form. The topics include University Studies and Student Life. Written practice includes communication with teachers and faculty administrators. | | | |
| 04XCESP2 | Czech for Foreigners - Advanced 2 | Z | 2 |
| This course extends the student´s knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical and specialist texts placing greater emphasis on individual work. | | | |
| 04XCESP3 | Czech for Foreigners - Advanced 3 | Z | 2 |
| The course develops the student´s knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation, and, finally, presentation of the student´s project. Writing skills necessary for professional communication are trained. | | | |
| 04XCESPZK | Czech for Foreign Students - Advanced Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESP1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher. | | | |
| 04XCESZ1 | Czech for Foreigners - Beginners 1 | Z | 2 |
| The course is designed for students of the English programme. Students will become acquainted with the main characteristics of Czech (phonetic and grammar features) and they will acquire basic language and speaking skills. The course focuses on pronunciation exercises, simple social phrases, and oral and written communication in the most common everyday situations. The course covers roughly lessons 1-3 of Čeština Express (Czech Express) by L. Holá and P. Bořilová. | | | |
| 04XCESZ2 | Czech for Foreigners - Beginners 2 | Z | 2 |
| The language and communication competences acquired in CESZ1 are further developed. Students deepen their knowledge of the declension and conjugation system and practise basic communication topics. The course covers roughly lessons 3-5 in Czech Express by L. Holá and P. Bořilová. | | | |
| 04XCESZ3 | Czech for Foreigners - Beginners 3 | Z | 2 |
| The course further develops the language and communication competences acquired in the XCESZ1 and XCESZ2 courses. The teaching focuses on building up basic vocabulary, fixing correct pronunciation and deepening grammar, features through practice, as well as introducing the Czech culture. Students are asked to produce simple texts and they practise frequent types of dialogue. They also practise understanding texts in terms of main ideas or looking for specific details in texts. The course covers roughly lessons 5-7 in Čeština expres 1. | | | |
| 04XCESZZK | Czech for Foreigners Beginners - Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the 04XCESZ1,2,3 courses and can only be taken after successful completion of all three courses. Detailed information is to be obtained from the teacher. | | | |
| 04XFM1 | French for Intermediate Students M1 | Z | 2 |
| French - intermediate FM The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and professional environment. They will be able to use the language to transmit general and technical information and to solve problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, systemizes and expands language skills gained in previous study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these texts. | | | |
| 04XFM2 | French for Intermediate Students M2 | Z | 2 |
| Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material. | | | |
| 04XFM3 | French for Intermediate Students M3 | Z | 2 |
| The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students´ future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one´s own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence. | | | |
| 04XFMZK | French for Intermediate Students Examination | ZK | 4 |
| The content is the examination as given by the study programme. The whole French programme is ended with an examination covering the contents of FM1-FM3. The examination consists of a written and oral part and is organized according to Examination Instructions, a document available on the web. | | | |
| 04XFP1 | French for Advanced Students P1 | Z | 2 |
| FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-imparfait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topics of specialization: mathematics, internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation. | | | |
| 04XFP2 | French for Advanced Students P2 | Z | 2 |
| With the link to P1 contents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication on given topics. Features typical of technical and scientific communication are stressed (passive voice, nominalization, word formation). | | | |
| 04XFP3 | French for Advanded Students P3 | Z | 2 |
| The course is focused on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in engineering environment. Special skill - translation of shorter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covers a technical /applied science topic. It is a creative work compiled from 3 French sources. Preparation of several set topics for oral examination. | | | |
| 04XFPZK | French for Advanced Students Examination | ZK | 4 |
| The whole French program is ended with an examination covering the contents of FP1-FP3. The examination consists of a written and/or an oral part and is organized according to Examination Instructions, a document available on the web. Assessment of the presentation is included into the examination grading. | | | |

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| 04XFZ1 | French for Beginners Z1 | Z | 2 |
| French for beginners The objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life , in socializing and in professional life. The course includes French for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able to communicate at elementary level, actively using the knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdová, French for beginners (Francouzština pro začátečky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar. | | | |
| 04XFZ2 | French for Beginners Z2 | Z | 2 |
| The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty. | | | |
| 04XFZ3 | French for Beginners Z3 | Z | 2 |
| The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts. | | | |
| 04XFZ4 | French for Beginners Z4 | Z | 2 |
| The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet. | | | |
| 04XFZ5 | French for Beginners Z5 | Z | 2 |
| All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive. | | | |
| 04XFZZK | French for Beginners Examination | ZK | 3 |
| The content is the examination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The examination is ruled by the document Instruction for examination. Its content covers the levels FZ1 - FZ5. | | | |
| 04XNM1 | German for Intermediate Students M1 | Z | 2 |
| The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability. | | | |
| 04XNM2 | German for Intermediate Students M2 | Z | 2 |
| The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses). | | | |
| 04XNM3 | German for Intermediate Students M3 | Z | 2 |
| The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses). | | | |
| 04XNMZK | German for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 assessment. More detailed information is to be obtained from the teacher. | | | |
| 04XNP1 | German for Advanced Students P1 | Z | 2 |
| This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning. | | | |
| 04XNP2 | German for Advanced Students P2 | Z | 2 |
| The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech). | | | |
| 04XNP3 | German for Advanced Students P3 | Z | 2 |
| The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German. | | | |
| 04XNPZK | German for Advanced Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The whole German for Advanced Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungraded assessment. More detailed information is to be obtained from the teacher. | | | |
| 04XRM1 | Russian for Intermediate Students M1 | Z | 2 |
| The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable. | | | |

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| 04XRM2 | Russian for Intermediate Students M2 | Z | 2 |
| The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable. | | | |
| 04XRM3 | Russian for Intermediate Students M3 | Z | 2 |
| The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable. | | | |
| 04XRMZK | Russian for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XRP1 | Russian for Advanced Students P1 | Z | 2 |
| The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills. | | | |
| 04XRP2 | Russian for Advanced Students P2 | Z | 2 |
| The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication. | | | |
| 04XRP3 | Russian for Advanced Students P3 | Z | 2 |
| The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics. | | | |
| 04XRPZK | Russian for Advanced Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XRZ1 | Russian for Beginners Z1 | Z | 2 |
| The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it. | | | |
| 04XRZ2 | Russian for Beginners Z2 | Z | 2 |
| The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing. | | | |
| 04XRZ3 | Russian for Beginners Z3 | Z | 2 |
| The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking. | | | |
| 04XRZ4 | Russian for Beginners Z4 | Z | 2 |
| The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals. | | | |
| 04XRZ5 | Russian for Beginners Z5 | Z | 2 |
| The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.) | | | |
| 04XRZZK | Russian for Beginners Examination | ZK | 3 |
| The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RZ1 - RZ5. Students are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instructions by the teacher. | | | |
| 04XSM1 | Spanish for Intermediate Students M1 | Z | 2 |
| The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them. | | | |
| 04XSM2 | Spanish for Intermediate Students M3 | Z | 2 |
| The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet. | | | |
| 04XSM3 | Spanish for Intermediate Students M3 | Z | 2 |
| The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination. | | | |
| 04XSMZK | Spanish for Intermediate Students Examination | ZK | 4 |
| The course content is the examination as given by the study plan. SMZK examination consists of two parts - written and oral; to be eligible for the written part, students will have obtained non-graded assessment for course SM3.Oral examination follows the written part. | | | |
| 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. | | | |

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| 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. | | | |
| 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. | | | |
| 12UNXAP | Introduction to UNIX | Z | 2 |
| Computer and operating systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interface. Hardware and software. Principles of operating systems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working with files. Text editors: vi, emacs. Command interpreter (shell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard tools. Graphical user interface X-windows. Computer networks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications | | | |
| 12UPF1 | Introduction to Computational Physics 1 | Z,ZK | 2 |
| Numerical simulation and its role in physics, methodology of writing computer codes. Computer languages for physics. Numerical libraries and program libraries for physics. Computer tools for scientific visualization. Computational fluid dynamics, hydrodynamic simulations, methods for discretization of Euler equations. High-performance computing, parallel computing, software for parallel simulations. Databases of scientific information, scientist evaluation, citation analysis. | | | |
| 12UPF2 | Introduction to Computational Physics 2 | Z,ZK | 2 |
| Nonlinear models, complex systems, chaotic systems, fractals and their applications in physics. Artificial intelligence methods: neural networks, machine learning, genetic algorithms, expert systems and their applications in physics. Quantum computing. Virtual reality. | | | |
| 12UVP | Introduction to Scientific Computing | Z | 2 |
| Practically oriented Introduction to scientific computing. Constituent part of the course is realized in computer classroom.Students get acquinted with some basic tools fort scientific and technicval computing, data analysis, data visualisation and algorithm development. | | | |
| 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. | | | |
| 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. | | | |
| 16DETE | Detectors of Ionizing Radiation | ZK | 4 |
| Gas filled detectors (ionization chambers, proportional counters, Geiger-Müller counters, corona counters), organic and inorganic scintillation detectors, Cherenkov counters, evaluation of light by photomultiplier, parameters of PMT, semiconductor detectors, cryogenic detectors. | | | |
| 16EPAM | Exact Methods in Research of Historic Monuments | ZK | 2 |
| Aims and methods of historic monument investigations, methods of age determination (radiocarbon, thermoluminescence and related methods, further radiation methods, dendrochronology, archaeomagnetism), analytical methods for determination of origin and production technologies of artefacts (activation analysis, X-ray fluorescence analysis and other methods), photogrammetry. | | | |
| 16EXK | Excursion | Z | 2 |
| Excursion in research institutes, laboratories and cooperative universities(CERN, JINR, TU Dresden,...) and modern research trends usig ionizing radiation. | | | |
| 16KPR | Clinical Propaedeutic | ZK | 2 |
| Making students familiar with the basics of anamnesis, physical examination, examinational methods of different organs, hematological and biochemical examinations and anaesthesia | | | |

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| 16OSE | Professional Seminar | Z | 3 |
| In the first part of the seminar, students familiarize themselves with the general principles of publishing and presenting scientific work and the formal requirements for bachelors degree projects at the faculty. The second part is designed as a practical training for the defence of the bachelors degree project. The students give oral presentations of the current state of the research results achieved during the work on their projects. Each presentation is followed by a discussion on scientific matters as well as on the possibilities of improving the students performance. Third part of the seminar deals with topical questions on nuclear and radiation physics, dosimetry, detectors of ionizing radiation, and radiation protection with focus on bachelor state final exams. Ph.D. students and academic staff lead this topical discussion with students about given questions and tries to help the students to accommodate learned knowledge form their studies in complex frame for application in practice. | | | |
| 16PADR | Practical Analysis of Data and Risks | KZ | 4 |
| The aim of the course is to provide students with a summary of basic theoretical knowledge, especially in the field of probability and statistics, useful for data and risk analysis. The main content of the course is practical application of theoretical procedures, especially data analysis using available software solution. Students will learn to perform comprehensive analysis and evaluation of data and risks. | | | |
| 16PNZ | Problems of Non-ionizing Radiation | KZ | 2 |
| Subject is focused on biological effects of non-ionizing radiation and its use in physical praxis. Information about principles, biological effects and methods used in fields of magnetic resonance and ultrasound as applied in various types of technical or medical equipment are given as well. | | | |
| 16PSE | Topical Dosimetry Seminar | Z | 2 |
| The seminary is supposed to motivate the students interest in the field of dosimetry and provide basic information about different applications of ionizing radiation in science, in research and in human life. The lectures are given by students and absolvents of DDAIR, who are currently employed at the department or in various organizations (SÚRO, v.v.i., ÚJF AV ČR v.v.i., ÚJV Řež, ČMI, Hospital Na Homolce, FN v Motole, PTC Czech s.r.o., CERN, Fermilab). The lectures will focus not only on describing research and current topics in the field of dosimetry, but students will also learn more about Bachelor degree thesis topics and thus will learn more about their possible specialization during the studies and afterwards. | | | |
| 16RAON | Radiation Protection | ZK | 4 |
| The course covers the basic principles of radiation protection. It describes not only the current approaches but also points to future developments. The course is accepted as training, which allows obtaining special competence in radiation protection and learner receives appropriate certificate. | | | |
| 16RAZP | Radioactivity in the Environment | Z,ZK | 3 |
| The course provides a comprehensive view of the source of ionizing radiation occurring in the environment. | | | |
| 16UAZB | Principles of Ionizing-Radiation Applications | ZK | 2 |
| Historical outline of applications, review of interaction of radiation with a matter, radiation sources, detectors and instrumentation, evaluation of radionuclide measurements, use of penetration and scattering of radiation beams, selected radioanalytical methods, tracer methods, radionuclide dating, further possibilities for the use of ionizing radiation. | | | |
| 16UJRF1 | Introductory Nuclear and Radiation Physics 1 | Z,ZK | 4 |
| The aim of the course is to provide students with basic knowledge about atomic nucleus and radiation physics, which is followed by other specialized lectures. The subject summarizes thematic areas: development of opinions on micro-wave and radiation physics, basic characteristics of the atom and nucleus, binding energy, measurement of mass and dimensions of the nuclei, the most important nuclear models. General characteristics of the interaction of ionizing radiation with the matter, interaction of alpha, beta, gamma and neutron radiation, passage of radiation beams through the matter, radiation effects in matter. | | | |
| 16UJRF2 | Introductory Nuclear and Radiation Physics 2 | Z,ZK | 4 |
| The aim of the course is to provide students with basic knowledge about atomic nucleus and radiation physics, which is followed by other specialized lectures. The subject summarizes thematic areas: general properties of radioactive decay, alpha decay, proton radioactivity, beta decay, gamma emission, natural radioactivity, properties and types of nuclear reactions, nuclear fission, transuranium elements, thermonuclear reaction. | | | |
| 16UVJZ | Introduction to Decommissioning of Nuclear Facilities | Z,ZK | 4 |
| The course aims to familiarise students with the actual decommissioning process. The syllabus of the subject is built in the sense of the actual course of the preparation and realization of the decommissioning project. It includes implementation of site decommissioning including legislative requirements to protect employees and the environment against radiation and waste management in their categorization, transport, release to the environment and disposal. It deals with documentation and centralization of monitoring systems. | | | |
| 16ZDOZ1 | Fundamentals of Radiation Dosimetry 1 | Z,ZK | 4 |
| History, development, and objectives of dosimetry. Quantities and units used for description of sources, fields, interactions of ionizing radiation, ionizations, energy transfer and absorption. Fundamentals of the effects of ionizing radiation. | | | |
| 16ZDOZ2N | Fundamentals of Radiation Dosimetry 2 | Z,ZK | 4 |
| Fundamentals of biological effects of ionizing radiation. Quantities and units used in radiation protection. Recommendations of ICRP and ICRU. Principles and methods of measurements in dosimetry. Determination of activity and neutron source emission. Measurements of absorbed dose and exposure. | | | |
| 16ZIVB | Introduction to Ecology | KZ | 2 |
| The subject inform about basic of the ecologic principles, terms and ideas. It covers overview information regarding to particular components of the environment and evaluate economic indicators and sustainable development. | | | |
| 16ZOZ | Sources of Irradiation and Environment | KZ | 4 |
| The subject provides an overview of the usage of ionizing radiation from its discovery and first applications to modern methods. It allows the student to acquire the basic knowledge about ionizing radiation usage. The subject deals with the fundamental issues related to ionizing radiation and the safety of dealing with the sources of IR. The course includes practical exercises with processing the data and subsequent presentation of the results. | | | |
| 16ZPRD | Elementary Labs | KZ | 3 |
| The aim of the course is to acquaint students with applications of ionizing radiation detectors and also with the principles of detection and spectrometry of ionizing radiation. Ionizing radiation detectors in this course is considered as a device which produces an evaluable signal at the time of interaction (unlike dosimeters). The aim of the course is to understand to basic principles of detection and calibration of common instruments in the field of ionizing radiation measurement. | | | |
| 16ZPSP | Basic Work with PC | Z | 2 |
| The aim of the course is to acquaint students with the basic skills related to working on a personal computer. The introductory part of the course is devoted to information systems and resources available at the CTU in Prague and the FNSPE. Emphasis is placed on effective handling of work with office productivity software (text editor, spreadsheet and presentation software) with exercises in MS Office. The practical content focuses mainly on further use during studies (laboratory reports, research work, bachelor's and diploma theses) and in specific practice (hospitals, state administration, companies). Other sections summarize basic information about computer hardware, software, and security. Completion of independent home exercises and participation in exercises above 60% is a necessary condition for passing the course. | | | |
| 16ZRAO | Basics of Radiation Protection | Z | 2 |
| The aim of the course is to familiarize students with the general principles of radiation protection. The main emphasis is put on basic mechanisms and concepts, in order to allow critical orientation in this field. The course provides answers to the cardinal questions: What is ionizing radiation (IR), where it comes from, whether and how it is dangerous for people, what is the meaning of protective units (Gray, Sievert), how to prevent malicious effect of IR and many others. The content of the lectures does not require any prior knowledge. | | | |
| 16ZRIZ | Health risks of ionizing radiation | ZK | 2 |
| The aim of the course is to acquaint students with the radiobiological basics of radiation protection. The basis of the course is an introduction to the biological effects of ionizing radiation (IR) at the molecular, cellular and tissue levels, an overview of deterministic and stochastic effects of ionizing radiation, health harm, risk and its evaluation, basics of epidemiology. | | | |

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| 17BPJI1 | Bachelor Thesis 1 | Z | 5 |
| Student on the basis of theses assignment and under leading of a supervisor individually processes given topic during 2 semesters. The subject is given by self-reliant work on given topic. The work is continuously check by a supervisor. | | | |
| 17BPJI2 | Bachelor Thesis 2 | Z | 10 |
| Student on the basis of theses assignment and under leading of a supervisor individually processes given topic during 2 semesters. The subject is given by self-reliant work on given topic. The work is continuously check by a supervisor. | | | |
| 17BPROV | Safe operation of nuclear facilities | KZ | 2 |
| The aim of the subject is to familiarize students with basic principles of nuclear safety. | | | |
| 17ENEF | Experimental Neutron Physics | KZ | 3 |
| The course is focused on experimental methods and experiments in the field of neutron physics, mainly using radionuclide neutron sources. The lectures are devoted to the theoretical bases necessary for preparation and realization of the laboratory exercises and to the methods of experimental data processing and evaluation. Specifically, the lectures provide detailed description of neutron properties and their utilization, the characteristics of neutron sources, properties of prompt and delayed neutrons, selected methods of neutron detection, neutron transport in substances, production, formation and modification of neutron fields and neutron beams. The lectures are complemented by the laboratory exercises in the field of neutron detection, measurement of delayed neutrons, study of neutron transport in various substances, experiments with various neutron sources (252Cf, AmBe, D-D neutron generator), preparation and detection of photo-neutron source, calibration of the radionuclide neutron source. The experiments are realized at the VR-1 training reactor and its laboratories. | | | |
| 17JARE | Nuclear Reactors | ZK | 2 |
| Introduction. World power issue. Previous evolution of power reactor. Nuclear fission reactors, fuel assemblies, active core, control systems, safety systems, containment. Classification of reactors into IV generations. Standard types of nuclear power reactors: concept, description, layout, previous evolution, world share, perspectives. Pressurized water reactors (PWR). Western-type PWR (Westinghouse, KWU, Framatom). VVER-type reactors , Temelín nuclear power plant. Boiling water reactors. Heavy water reactors, fast breeder reactors, high-temperature gas cooled reactors. Second nuclear era. reactors of generation III (EPR, AP-1000, VVER 1200). Reactors of generation IV: GIF and INPRO initiatives. Evaluation and selection of proposed systems. Six selected concepts. ICRP scenarios of word evolution, hydrogen power, role of nuclear power in long-term outlook | | | |
| 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. | | | |
| 18PRC1 | Programming in C++ 1 | Z | 4 |
| This course covers mainly the C programming language and non-object oriented features of the C++ language. | | | |
| 18PRC2 | Programming in C++ 2 | KZ | 4 |
| This course covers the object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Template Library. | | | |
| 18ZALG | Basics of Algorithmization | Z,ZK | 4 |
| This course is devoted to selected algorithms and methods for algorithm design. This course intruduces selected methods for the determination of the algorithm complexity. | | | |
| 18ZPRO | Basics of Programming | Z | 4 |
| This course is intended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in programming and with the Python programming language. | | | |
| 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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