Study plan

Name of study plan: Quantum Technologies

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

Name of the block: Compulsory courses in the program
Minimal number of credits of the block: 0
The role of the block: P

Code of the group: BSPQT1
Name of the group: BS P_QTB 1st year
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 15 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 **Martin Štefa ák** Igor Jex (Gar.)	Z	2	2+0	Z	P
02ELMA	**Electricity and Magnetism** Iskender Yalcinkaya, Josef Schmidt, Ji í Hrivnák, Goce Chadzitaskos, Jan Vysoký **Jan Vysoký** Josef Schmidt (Gar.)	Z,ZK	6	4+2	L	P
01LAL	**Linear Algebra 1** Petr Ambrož, Lubomíra Dvo áková **Lubomíra Dvo áková** Lubomíra Dvo áková (Gar.)	Z	2	2P+2C		P
01LALZ	**Linear Algebra 1, exam** Petr Ambrož, Lubomíra Dvo áková **Lubomíra Dvo áková** Lubomíra Dvo áková (Gar.)	ZK	2	0P+0C		P
01LAL2	**Linear Algebra 2** Petr Ambrož, Lubomíra Dvo áková **Lubomíra Dvo áková** Lubomíra Dvo áková (Gar.)	Z,ZK	4	2P+2C		P
01MAN	**Calculus 1** Pavel Strachota, Miroslav Kolá , Edita Pelantová **Pavel Strachota** Pavel Strachota (Gar.)	Z	4	4+4		P
01MANZ	**Calculus 1, exam** Pavel Strachota, Miroslav Kolá , Edita Pelantová **Pavel Strachota** Pavel Strachota (Gar.)	ZK	4	0P+0C		P
01MAN2	**Calculus 2** Miroslav Kolá , Edita Pelantová, Maksym Dreval **Edita Pelantová** Maksym Dreval (Gar.)	Z,ZK	8	4P+4C		P
02MECH	**Mechanics** David B e **Antonín Hoskovec** David B e (Gar.)	Z	4	4+2	Z	P
02MECHZ	**Mechanics - Examination** Iskender Yalcinkaya, Goce Chadzitaskos, Stanislav Skoupý, Petr Novotný, David B e , Filip Petrásek, Antonín Hoskovec **Antonín Hoskovec** David B e (Gar.)	ZK	2	-	Z	P
00PT	**Preparatory Week** Petr Ambrož, Milan Krbálek **Petr Ambrož** Petr Ambrož (Gar.)	Z	2	týden	Z	P
02TER	**Heat and Molecular Physics** Filip Petrásek **Petr Novotný** Petr Jizba (Gar.)	Z,ZK	4	2+2	L	P
02ZM1	**Foundations of Physical Measurements 1** Solangel Rojas Torres, Petr Chaloupka **Martin Štefa ák** Petr Chaloupka (Gar.)	ZK	2	2P+0C	Z	P

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

Characteristics of the courses of this group of Study Plan: Code=BSPQT1 Name=BS P_QTB 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.				
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: BSPQT2

Name of the group: BS P_QTB 2nd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 10 courses

Credits in the group: 0

Note on the group:　Předmět 02TEF1 lze absolvovat až po absolvování předmětu 02MECHZ.Předmět 02TEF2 lze absolvovat až po absolvování předmětů 02ELMA a 02TEF1.

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
02PRA1	**Experimental Laboratory 1** *Libor Škoda, Jaroslav Biel ík* **Jaroslav Biel ík** *Jaroslav Biel ík (Gar.)*	KZ	6	0+4	Z	P
02PRA2	**Experimental Laboratory 2** *Libor Škoda, Jaroslav Biel ík* **Jaroslav Biel ík** *Jaroslav Biel ík (Gar.)*	KZ	6	0+4	L	P
01ANB3	**Calculus B 3** *Miroslav Kolá , Milan Krbálek* **Milan Krbálek** *Miroslav Kolá (Gar.)*	Z,ZK	8	4P+4C		P

01ANB4	**Calculus B 4** *Ji í Mikyška, Miroslav Kolá* **Ji í Mikyška** *Milan Krbálek (Gar.)*	Z,ZK	6	2P+4C		P
12NME1	**Numerical Methods 1** *Pavel Váchal* **Pavel Váchal** *Pavel Váchal (Gar.)*	Z,ZK	4	2+2	L	P
02TEF1	**Theoretical Physics 1** *Petr Novotný* **Michal Jex** *Igor Jex (Gar.)*	Z,ZK	4	2+2	Z	P
02TEF2	**Theoretical Physics 2** *Petr Novotný, Filip Petrásek* **Josef Schmidt** *Petr Novotný (Gar.)*	Z,ZK	4	2+2	L	P
02TSFA	**Thermodynamics and Statistical Physics** *Igor Jex, Jaroslav Novotný* **Antonín Hoskovec** *Igor Jex (Gar.)*	Z,ZK	4	2+2	L	P
12ULAT	**Introduction to Laser Technique** *Helena Jelínková, Jan Šulc* **Helena Jelínková** *Helena Jelínková (Gar.)*	KZ	2	1+1	Z	P
02VOAF	**Waves, Optics and Atomic Physics** *Josef Schmidt* **Jan Vysoký** *Ji í Tolar (Gar.)*	Z,ZK	6	4+2	Z	P

Characteristics of the courses of this group of Study Plan: Code=BSPQT2 Name=BS P_QTB 2nd year

02PRA1	Experimental Laboratory 1	KZ	6

Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with theliterature), the implementation of the measurement (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluation of results. At the same time practically extendthe knowledge gained in lectures on physics.

02PRA2	Experimental Laboratory 2	KZ	6

Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with theliterature), the implementation of the measurement (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluation of results. At the same time practically extendthe knowledge gained in lectures on physics.

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 po et funkcí více prom nných a funkcionálních vektor . [2] Funkce zadané implicitn . [3] Taylorovy ady funkce více prom nných. [4] Regulární zobrazení, zám na prom nných, nekartézské soustavy sou adnic. [5] Lokální, vázané a globální extrémy funkce více prom nných. [6] Základy teorie míry a obrys konstrukce Lebesgueovy míry. [7] Integrální po et funkce více prom nných - Riemann v a Lebesgue v integrál, základní vlastnosti, Fubiniova v ta, v ta o substituci. Leviho a Lebesgueova v ta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po k ivkách a plochách. Integrální v ty.

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.

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 different 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).

02TEF2	Theoretical Physics 2	Z,ZK	4

Tensors and transformations in physics. Mechanics of point mass, rigid body and continuum. The special theory of relativity: relativistic mechanics and classical field theory in the Minkowski space-time. Classical electrodynamics: Maxwell's equations in the Minkowski space-time, electromagnetic waves in dielectric media, electromagnetic radiation in the dipole approximation.

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.

12ULAT	Introduction to Laser Technique	KZ	2

Overview of electromagnetic radiation sources; laser principle; classification of lasers; characterization and rough application of various types of lasers; laser safety precautions. The laser amplifier, Q-switching, mode-locking.

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

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

Code of the group: BSPQT3

Name of the group: BS P_QTB 3rd year

Requirement credits in the group:

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

Credits in the group: 0

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

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* **authors** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
02BPQT1	**Bachelor Thesis 1** *Aurél Gábor Gábris* *Martin Štefa ák (Gar.)*	Z	5	0P+5C	Z	P
02BPQT2	**Bachelor Thesis 2** *Aurél Gábor Gábris* *Martin Štefa ák (Gar.)*	Z	10	0P+10C	L	P
02KM1	**Quantum Mechanics 1** *Martin Štefa ák* **Martin Štefa ák** *Martin Štefa ák (Gar.)*	Z,ZK	6	4P+2C	Z	P
02KM2	**Quantum Mechanics 2** *Martin Štefa ák* **Martin Štefa ák** *Martin Štefa ák (Gar.)*	Z,ZK	6	4P+2C	L	P
11KPRA1	**Quantum Laboratory 1** *Ladislav Kalvoda* *Ladislav Kalvoda (Gar.)*	KZ	4	4L	Z	P
02KPRA2	**Quantum Laboratory 2** *Jan epila* **Jan epila** *Jan epila (Gar.)*	KZ	4	4L	L	P
01PRST	**Probability and Statistics** *Tomáš Hobza* **Tomáš Hobza** *Tomáš Hobza (Gar.)*	Z,ZK	4	3+1	Z	P
01RMAF	**Equations of Mathematical Physics** *Václav Klika* **Václav Klika** *Václav Klika (Gar.)*	Z,ZK	7	4P+2C		P
12KOE	**Fundamentals of Classical Optics and Electrodynamics** *Ivan Richter, Pavel Kwiecien, Milan Ši or* **Pavel Kwiecien** *Ivan Richter (Gar.)*	ZK	4	4P	L	P

Characteristics of the courses of this group of Study Plan: Code=BSPQT3 Name=BS P_QTB 3rd year

02BPQT1	Bachelor Thesis 1				Z	5

Bachelors thesis on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Supervision and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.

02BPQT2	Bachelor Thesis 2				Z	10

Bachelors thesis on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Supervision and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.

02KM1	Quantum Mechanics 1				Z,ZK	6

Abstract:The lecture describes the birth of quantum mechanics and description of one particle and more particles by elements of the Hilbert space as well as its time evolution. Besides that it includes description of observable quantities by operators in the Hilbert space and calculation of their spectra.

02KM2	Quantum Mechanics 2				Z,ZK	6

Abstract: The lecture expands the introduction to quantum mechanics with more general formalism of quantum theory, approximate methods and path integral. It summarizes the terminology and methods used in various applications of quantum mechanics and prepares the students for an effective scientific research and further study, in particular, of the modern formulations of quantum field theory.

11KPRA1	Quantum Laboratory 1				KZ	4

In the first part of the semester, the students will gain basic practical skills in laser physics and usually used measurement methods and techniques. In the second part the students will focus on tasks in preparation of low-dimensional systems, physics of low temperatures and basic structure and spectroscopic methods of solid state physics.

02KPRA2	Quantum Laboratory 2				KZ	4

Physical measurements designed to master the operation of devices used in physics and technology dealing with experiments at the quantum level. Experiments are chosen such that the student will become accostumed with demanding parts of experimental physics and demonstrate quantum effects.

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.

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).

12KOE	Fundamentals of Classical Optics and Electrodynamics				ZK	4

The lecture is focused on the basics of classical optics and electrodynamics, which is important especially in relation to quantum optical theory. The lecture deals with electromagnetic theory, physical optics, material aspects of optical phenomena, introduction to geometrical optics, and fundamentals of nonlinear optics, including dispersion theory of linear and nonlinear response in optical media, including anisotropic ones. Attention is also given to beam optics. Further, it focuses on the implications of statistical properties of light, explains the basics of diffraction theory and holography. It explains the relation between wave optics and ray optics, describes light propagation in term of rays, and outlines the fundamentals of instrumental optics. It also includes the basics of guided waves and resonators - the theory of guided waves in waveguides and optical fibers, waveguide modes and waveguide dispersion, reciprocity theorem and optical resonator theory.

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-ANGL.PR.
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
00RET	**Rhetoric** *Jana Ková ová* **Jana Ková ová** *Jana Ková ová (Gar.)*	Z	1	0+2		PV

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

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.						

Code of the group: BSPJAZYKYZK

Name of the group: BS P languages

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* **authors** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
04XAMZK	**English for Intermediate Students Examination** *Jana Ková ová, Slav na Brownová* **Jana Ková ová**	ZK	4		Z	PV
04XAPZK	**English for Advanced Students Examination** *Slav na Brownová, Darren Copeland* **Jana Ková ová**	ZK	4		Z	PV
04XCESZZK	**Czech for Foreigners Beginners - Examination** *Slav na Brownová* **Jana Ková ová** *Jana Ková ová (Gar.)*	ZK	4		Z	PV
04XCESMZK	**Czech for Intermediate Students Examination** *Jana Ková ová* **Jana Ková ová** *Jana Ková ová (Gar.)*	ZK	4		Z	PV
04XCESPZK	**Czech for Foreign Students - Advanced Examination** *Jana Ková ová* **Jana Ková ová** *Jana Ková ová (Gar.)*	ZK	4		Z	PV
04XFMZK	**French for Intermediate Students Examination** *V ra Šlechtová* **V ra Šlechtová** *V ra Šlechtová (Gar.)*	ZK	4		Z	PV
04XFPZK	**French for Advanced Students Examination** *V ra Šlechtová* **V ra Šlechtová** *V ra Šlechtová (Gar.)*	ZK	4		Z	PV
04XFZZK	**French for Beginners Examination** *V ra Šlechtová* **V ra Šlechtová** *V ra Šlechtová (Gar.)*	ZK	3		L	PV
04XNMZK	**German for Intermediate Students Examination** *Miloslava echová* **Miloslava echová** *Miloslava echová (Gar.)*	ZK	4		Z	PV
04XNPZK	**German for Advanced Students Examination** *Miloslava echová* **Miloslava echová** *Miloslava echová (Gar.)*	ZK	4		Z	PV
04XRMZK	**Russian for Intermediate Students Examination** *Zhanna Isaeva* **Zhanna Isaeva** *Zhanna Isaeva (Gar.)*	ZK	4		Z	PV
04XRPZK	**Russian for Advanced Students Examination** *Zhanna Isaeva* **Zhanna Isaeva** *Zhanna Isaeva (Gar.)*	ZK	4		Z	PV
04XRZZK	**Russian for Beginners Examination** *Zhanna Isaeva* **Zhanna Isaeva** *Zhanna Isaeva (Gar.)*	ZK	3		L	PV
04XSMZK	**Spanish for Intermediate Students Examination** *Beatriz Vadillo Gonzalo* **Beatriz Vadillo Gonzalo** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	4		Z	PV
04XSPZK	**Spanish for Advanced Students Examination** *Beatriz Vadillo Gonzalo* **Beatriz Vadillo Gonzalo** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	4		Z	PV
04XSZZK	**Spanish for Beginners Examination** *Beatriz Vadillo Gonzalo* **Beatriz Vadillo Gonzalo** *Beatriz Vadillo Gonzalo (Gar.)*	ZK	3		L	PV

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

04XAMZK	English for Intermediate Students Examination		ZK	4
The course content is the examination as given by the study plan. The examination covers the AM1, AM2, and AM3 courses and consists of two parts - written (100 min) and oral (20-30 min). The student is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English courses.				
04XAPZK	English for Advanced Students Examination		ZK	4
The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (100 min) and oral (30 min) and includes also oral presentation of a topic from the student´s field of study.				
04XCESZZK	Czech for Foreigners Beginners - Examination		ZK	4
The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the 04XCESZ1,2,3 courses and can only be taken after successful completion of all three courses. Detailed information is to be obtained from the teacher.				
04XCESMZK	Czech for Intermediate Students Examination		ZK	4
The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESM1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.				

04XCESPZK	Czech for Foreign Students - Advanced Examination		ZK	4
The course content is the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the CESP1,2,3 courses and can only be taken after successful completion of the 3 courses. Detailed information is to be obtained from the teacher.				
04XFMZK	French for Intermediate Students Examination		ZK	4
The content is the examination as given by the study programme. The whole French programme is ended with an examination covering the contents of FM1-FM3. The examination consists of a written and oral part and is organized according to Examination Instructions, a document available on the web.				
04XFPZK	French for Advanced Students Examination		ZK	4
The whole French program is ended with an examination covering the contents of FP1-FP3. The examination consists of a written and/or an oral part and is organized according to Examination Instructions, a document available on the web. Assessment of the presentation is included into the examination grading.				
04XFZZK	French for Beginners Examination		ZK	3
The content is the examination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The examination is ruled by the document Instruction for examination. Its content covers the levels FZ1 - FZ5.				
04XNMZK	German for Intermediate Students Examination		ZK	4
The course content is the examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 assessment. More detailed information is to be obtained from the teacher.				
04XNPZK	German for Advanced Students Examination		ZK	4
The course content is the examination as given by the study plan. The whole German for Advanced Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungraded assessment. More detailed information is to be obtained from the teacher.				
04XRMZK	Russian for Intermediate Students Examination		ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher.				
04XRPZK	Russian for Advanced Students Examination		ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher.				
04XRZZK	Russian for Beginners Examination		ZK	3
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RZ1 - RZ5. Students are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instructions by the teacher.				
04XSMZK	Spanish for Intermediate Students Examination		ZK	4
The course content is the examination as given by the study plan. 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: BSPQTV
Name of the group: BS P_QTB 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
02DEF2	**History of Physics 2** *Igor Jex Igor Jex (Gar.)*	Z	2	2+0	L	V
02DPD1	**Detectors and Principles of Detection 1** *Solangel Rojas Torres, Jesus Guillermo Contreras* **Martin Štefa ák** *Jesus Guillermo Contreras (Gar.)*	ZK	2	2P+0C	Z	V
02DPD2	**Detectors and Principles of Detection 2** *Solangel Rojas Torres, Jesus Guillermo Contreras* **Martin Štefa ák** *Jesus Guillermo Contreras (Gar.)*	ZK	4	4P+0C	L	V
02EXF	**Experimental Physics** *Jaroslav Adam, Barbara Antonina Trzeciak, Jaroslava Óbertová, Katarína K ížková Gajdošová* **Jaroslava Óbertová** *Katarína K ížková Gajdošová (Gar.)*	ZK	2	2P+0C	Z	V
01FKO	**Functions of Complex Variable** *Severin Pošta, Pavel Š oví ek* **Pavel Š oví ek** *Pavel Š oví ek (Gar.)*	Z,ZK	3	2+1		V
02FYS1	**Physical Seminar 1** **Martin Štefa ák** *Filip Petrásek (Gar.)*	Z	2	0+2	Z	V

Code	Course						
04AKS	**English Conversation** *Jana Ková ová Jana Ková ová (Gar.)*	Z	1	0+2	L		V
12LAS	**Laser Systems** *Václav Kube ek **Václav Kube ek** Václav Kube ek (Gar.)*	Z,ZK	3	2+1	L		V
00MAM1	**Essentials of High School Course 1** *David B e **Martin Štefa ák***	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
12MOF	**Molecular Physics** *Jan Proška, Martin Michl **Martin Michl** Jan Proška (Gar.)*	ZK	2	2+0	L		V
02NSAD1	**Simulations and Data Analysis Tools 1** *Zden k Hubá ek **Zden k Hubá ek** Zden k Hubá ek (Gar.)*	Z	2	2P+0C	Z		V
02NSAD2	**Simulations and Data Analysis Tools 2** *Zden k Hubá ek **Zden k Hubá ek** Zden k Hubá ek (Gar.)*	Z	2	2+0			V
18NES2	**Neural Networks 2** *František Vold ich, Zuzana Pet í ková **Zuzana Pet í ková** Zuzana Pet í ková (Gar.)*	KZ	3	0P+2C	L		V
15CH1	**General Chemistry 1** *Ond ej Holas, Petr Distler, Václav uba **Petr Distler** Petr Distler (Gar.)*	Z	3	2+1	Z		V
15CH2	**General Chemistry 2** *Ond ej Holas, Petr Distler, Václav uba **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
18PPY1	**Programming in Python 1** *Jakub Klinkovský, Matej Mojzeš **Jakub Klinkovský** Jakub Klinkovský (Gar.)*	Z	2	2C	L		V
11SFIPL	**Seminar on Solid State Physics** *Ladislav Kalvoda **Ladislav Kalvoda** Ladislav Kalvoda (Gar.)*	KZ	2	1+1			V
02STR	**Special Theory of Relativity** *David B e **Martin Štefa ák** David B e (Gar.)*	ZK	2	2+0	L		V
TV-1	**Physical Education**	Z	1		Z		V
TV-2	**Physical Education**	Z	1		L		V
TV-3	**Physical education**	Z	1	0+2	Z		V
TV-4	**Physical education**	Z	1	0+2	L		V
14TED	**Creating Electronic Documents** *Aleš Materna, Ji í Martin ík **Aleš Materna** Aleš Materna (Gar.)*	Z	2	26C			V
12UFN	**Introduction to Photonics and Nanostructures** *Ivan Richter, Pavel Kwiecien, Jan Proška **Ivan Richter** Ivan Richter (Gar.)*	KZ	3	2P+1C	L		V
02UFEC	**Introduction to Elementary Particle Physics** *Jaroslav Biel ík, Marek Matas **Jaroslav Biel ík** Jaroslav Biel ík (Gar.)*	Z	2	2+0	Z		V
11UFPLN	**Introduction to Solid State Physics** * **Petr Kolenko***	ZK	2	2+0	L		V
11UFP	**Introduction to Solid State Physics** *Petr Kolenko Petr Kolenko (Gar.)*	ZK	3		L		V
17UING	**Introduction to Engineering** *Jan Frýbort, Petr Haušild, Radek Mušálek Jan Frýbort (Gar.)*	KZ	3	2P+1C	Z		V
02UKT	**Introduction to Quantum Theory** *Martin Štefa ák **Martin Štefa ák** Martin Štefa ák (Gar.)*	Z	2	2+0			V
12UMF	**Introduction to Modern Physics** *Jan Pšikal **Jan Pšikal** Jan Pšikal (Gar.)*	Z	3	2+1	L		V
12UNXAP	**Introduction to UNIX** *Milan Kucha ík **Milan Kucha ík** Milan Kucha ík (Gar.)*	Z	2	1P+1C	L		V
12UVP	**Introduction to Scientific Computing** *Milan Ši or **Milan Ši or** Milan Ši or (Gar.)*	Z	2	1P+1C	L		V
12VKT	**Vacuum Technology** *Richard Švejkar **Vojt ch Petrá ek** Vojt ch Petrá ek (Gar.)*	KZ	4	2P+2L	Z		V
12PYTH	**Scientific Programming in Python** *Pavel Váchal, Jakub Urban **Pavel Váchal** Pavel Váchal (Gar.)*	Z	2	0+2	L		V
12VTV	**Scientific and Technical Computing** *Ivan Procházka **Ivan Procházka** Ivan Procházka (Gar.)*	Z	2	1+1	L		V
12ZPLT	**Basic Laser Technique Laboratory** *Václav Kube ek, Josef Blažej **Josef Blažej** Václav Kube ek (Gar.)*	KZ	6	0+4	L		V
12ZEL1	**Basic Electronics 1** *Jaroslav Pavel **Jaroslav Pavel** Jaroslav Pavel (Gar.)*	Z,ZK	3	2+1	Z		V
12ZEL2	**Basic Electronics 2** *Jaroslav Pavel **Jaroslav Pavel** Jaroslav Pavel (Gar.)*	Z,ZK	3	2+1	L		V
12ZFS	**Fundamentals of Photonic Structures** *Ivan Richter, Ji í tyroký **Ivan Richter** Ivan Richter (Gar.)*	Z,ZK	2	2P	L		V
11ZFP	**Basic to Solid State Physics** *Ladislav Kalvoda, Eva Mihóková Ladislav Kalvoda (Gar.)*	ZK	3		Z		V
11ZFPL	**Basic to Solid State Physics** * **Eva Mihóková***	KZ	2	26P+0C	Z		V

Characteristics of the courses of this group of Study Plan: Code=BSPQTV Name=BS P_QTB Optional courses

Code	Name	Type	Credits
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.			
02DPD1	Detectors and Principles of Detection 1	ZK	2
Abstract: The lectures introduce the main forms of interaction of some particles with matter. The goal is that the student gets an overview of what type of processes are possible and in which situations they may be dominant. Some applications to Medicine and to study the fundamental structure of matter are presented.			
02DPD2	Detectors and Principles of Detection 2	ZK	4
Abstract: The lectures introduce the main ideas needed to understand how detector systems work. It will be focused on gaseous detecting principles, scintilating principles and semiconductor detecting principles. Basic information about various detector constructions is provided.			
02EXF	Experimental Physics	ZK	2
The goal of this subject is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are used for such measurements, and the analysis of measured data.			
01FKO	Functions of Complex Variable	Z,ZK	3
The course starts from outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable are explained in detail: the derivative of a complex function and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, Cauchy's integral theorem, Morera's theorem, roots of a holomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy estimates, Laurent series, residue theorem.			
02FYS1	Physical Seminar 1	Z	2
The seminar is devoted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physics presented in the course of Mechanics. The problems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equipments.			
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.			
12LAS	Laser Systems	Z,ZK	3
Pulsed solid state nanosecond lasers. Picosecond lasers. High energy laser systems. Laser fusion. Diode-pumped solid state lasers. Tunable lasers. Optical parametric generators and raman lasers. Semiconductor lasers for pumping of solid state lasers and diode pumped solid state lasers Amplified spontaneous emission. Ultraviolet lasers. X-ray lasers. High power continuous lasers. Infrared high power lasers. Submilimeter lasers. Lasers with high degree of coherence. Free electron lasers.			
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.			
12MOF	Molecular Physics	ZK	2
Basic ideas on physics of molecules and molecular matter, and on structure-to-physical properties relationship. Methods of molecular structure determination.			
02NSAD1	Simulations and Data Analysis Tools 1	Z	2
Data analysis and simulations of high energy elementary particle collisions. ROOT and Pythia programs.			
02NSAD2	Simulations and Data Analysis Tools 2	Z	2
Individual work will include implementation and testing of a program for generating of particle collision. Results are reviewed.			
18NES2	Neural Networks 2	KZ	3
The aim of the course "Neural Networks 2" is to acquaint students with basic models of deep neural networks and teach them how to apply these models and methods to solve practical tasks.			
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.			
18PPY1	Programming in Python 1	Z	2
This course introduces students to advanced features of the Python language and common scientific packages. The course covers both object-oriented as well as functional programming paradigms. The following part of the course describes the use of Python in the fields of scientific and technical computing (NumPy and SciPy packages), data processing and visualization.			
11SFIPL	Seminar on Solid State Physics	KZ	2
1.Introduction of the Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations of diffractive phenomena related to following themes: crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, atomic scattering factor, structural factor, extinction, practical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorder on diffraction pattern, atomization and thermal oscillations, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and standing waves, normal modes, polarization, energy and momentum transport, infinite chain, chain of finite lenght, boundary conditions, wave packets, group and phase velocity, dispersion, pulses and their propagation, localized modes, anharmonicity 8."debye" module - lattice dynamics and thermal capacity ? theory 9.Simulations: Brillouine zone, dispersion relation, density of states, thermal energy, heat capacity 10."drude" module - dynamics of classical electron gas in 2D ? theory 11.Simulations: diffuse electron movement, electron drift in an external electric field, Haynes and Shockley experiment, electron mobility, electron motion in magnetic field, cyclotron frequency, Hall experiment, magnetorezistence 12.Assignment, elaboration and presentation of the seminar work.			
02STR	Special Theory of Relativity	ZK	2
Students extend their knowledge of classical, non-quantum mechanics of the special theory of relativity fundamentals.			
TV-1	Physical Education	Z	1
TV-2	Physical Education	Z	1

Code	Course	Type	Credits
TV-3	Physical education	Z	1
TV-4	Physical education	Z	1
14TED	Creating Electronic Documents	Z	2
Basic skills for creating and presenting student theses. Individual exercises focus on creating and formatting texts, equations, charts, tables, presentations and entire documents in an office suite.			
12UFN	Introduction to Photonics and Nanostructures	KZ	3
Overview of nanostructures and nanotechnologies; quantum technologies; quantum nanostructures; photonic structures; nanophotonics and nanoplasmonics; optical waveguides and fibers; integrated photonics; computer simulations; technological realization; student presentations			
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.			
11UFPLN	Introduction to Solid State Physics	ZK	2
The purpose of this lecture is to introduce the undergraduate students to the study of the solid state physics.			
11UFP	Introduction to Solid State Physics	ZK	3
The course contains the fundamentals of diffraction stress analysis with a strong emphasis on the illustrations of the capability of X-ray diffraction to solve engineering problems.			
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.			
02UKT	Introduction to Quantum Theory	Z	2
The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.			
12UMF	Introduction to Modern Physics	Z	3
The course is intended to be a concise introduction to modern / nonclassical physics for students who have already had basic classical physics course. A part of the course is delivered in a computational 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			
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.			
12VKT	Vacuum Technology	KZ	4
Rarefied gasses: basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surface; sorption, desorption; gas transport through solid matter; evaporation, condensation;Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their properties:-Positive displacement pumps: Diaphragm, Sliding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorption pumps, Sublimation and NEG pumps, Ion getter pumps..Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Materials and vacuum components and seals.Practical exercises.			
12PYTH	Scientific Programming in Python	Z	2
The aim of this course is to learn the fundamentals of the modern Python programming language with a focus on scientific computing. Emphasis is placed on effective solutions to real problems. The course is performed in an interactive form of practical exercises, whose topics can be tailored to the content of other subjects or student theses. Students are also involved in ongoing research. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented or functional programming. The greater part of the course focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciPy and the Matplotlib graphics library. We show how to generate efficient code, how to combine Python with other languages, what tools are available.			
12VTV	Scientific and Technical Computing	Z	2
The students get familiar with methods of solving of computational problems in the scientific and technical practice, and with methods of their programming. The course is oriented mainly to programming in the Fortran language.			
12ZPLT	Basic Laser Technique Laboratory	KZ	6
Lasers, solid state Nd:YAG laser, laser crystal, laser discharge lamp, laser cavity, resonator, free-running, Q-switching, laser amplifier. second harmonic, He-Ne glow discharges, laser diode, diode pumped Nd:YAG laser, CO2 laser marking, laser materials properties, non-linear transmission, laser beam transverse profile, acousto-optic modulators.			
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.			
12ZFS	Fundamentals of Photonic Structures	Z,ZK	2
The lecture covers the basics of photonic structures, it classifies photonic structures compares them with the electronic structures, summarizes their preparation and characterization. Specifically, the lecture discusses the basic physics and technology of optical waveguides; it introduces basic linear, nonlinear, and active structures of integrated photonics for applications in optical communications and sensors. Next, the attention is given to introduction of plasmonic structures and plasmonics, periodic structures and photonic crystals, metamaterials, metasurfaces, and finally to photonic structures for quantum technologies. Finally, the lecture is closed with student presentations on selected relevant topics and excursions to selected photonic laboratories.			
11ZFP	Basic to Solid State Physics	ZK	3
Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids			
11ZFPL	Basic to Solid State Physics	KZ	2
Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids			

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 Ková ová*	Z	2	0+2	Z	V
04XAM2	**English for Intermediate Students M2** *Jana Ková ová*	Z	2	0+2	L	V
04XAM3	**English for Intermediate Students M3** *Jana Ková ová*	Z	2	0+2	Z	V
04XAP1	**English for Advanced Students P1** *Jana Ková ová*	Z	2	0+2	Z	V
04XAP2	**English for Advanced Students P2** *Jana Ková ová*	Z	2	0+2	L	V
04XAP3	**English for Advanced Students P3** *Jana Ková ová*	Z	2	0+2	Z	V
04XCESZ1	**Czech for Foreigners - Beginners 1** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	Z	V
04XCESZ2	**Czech for Foreigners - Beginners 2** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	L	V
04XCESZ3	**Czech for Foreigners - Beginners 3** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	2S	Z	V
04XCESM1	**Czech for Foreigners - Intermediate 1** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	Z	V
04XCESM2	**Czech for Foreigners - Intermediate 2** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	L	V
04XCESM3	**Czech for Foreigners - Intermediate 3** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	Z	V
04XCESP1	**Czech for Foreign Students - Advanced 1** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	Z	V
04XCESP2	**Czech for Foreigners - Advanced 2** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	L	V
04XCESP3	**Czech for Foreigners - Advanced 3** *Jana **Ková ová** Jana Ková ová (Gar.)*	Z	2	0+2	Z	V
04XFM1	**French for Intermediate Students M1** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	Z	V
04XFM2	**French for Intermediate Students M2** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	L	V
04XFM3	**French for Intermediate Students M3** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	Z	V
04XFP1	**French for Advanced Students P1** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	Z	V
04XFP2	**French for Advanced Students P2** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	L	V
04XFP3	**French for Advanded Students P3** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+2	Z	V
04XFZ1	**French for Beginners Z1** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+4	L	V
04XFZ2	**French for Beginners Z2** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+4	Z	V
04XFZ3	**French for Beginners Z3** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+4	L	V
04XFZ4	**French for Beginners Z4** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+4	Z	V
04XFZ5	**French for Beginners Z5** *V ra **Šlechtová** V ra Šlechtová (Gar.)*	Z	2	0+4	L	V
04XNM2	**German for Intermediate Students M2** *Miloslava **echová** Miloslava echová (Gar.)*	Z	2	0+2	L	V
04XNM1	**German for Intermediate Students M1** *Miloslava **echová** Miloslava echová (Gar.)*	Z	2	0+2	Z	V
04XNM3	**German for Intermediate Students M3** *Miloslava **echová** Miloslava echová (Gar.)*	Z	2	0+2	Z	V
04XNP1	**German for Advanced Students P1** *Miloslava **echová** Miloslava echová (Gar.)*	Z	2	0+2	Z	V
04XNP2	**German for Advanced Students P2** *Miloslava **echová** Miloslava echová (Gar.)*	Z	2	0+2	L	V

04XNP3	**German for Advanced Students P3** *Miloslava echová* Miloslava echová (Gar.)	Z	2	0+2	Z	V
04XRM1	**Russian for Intermediate Students M1** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	Z	V
04XRM2	**Russian for Intermediate Students M2** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	L	V
04XRM3	**Russian for Intermediate Students M3** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	Z	V
04XRP1	**Russian for Advanced Students P1** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	Z	V
04XRP2	**Russian for Advanced Students P2** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	L	V
04XRP3	**Russian for Advanced Students P3** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+2	Z	V
04XRZ1	**Russian for Beginners Z1** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+4	L	V
04XRZ2	**Russian for Beginners Z2** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+4	Z	V
04XRZ3	**Russian for Beginners Z3** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+4	L	V
04XRZ4	**Russian for Beginners Z4** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+4	Z	V
04XRZ5	**Russian for Beginners Z5** *Zhanna Isaeva* Zhanna Isaeva (Gar.)	Z	2	0+4	L	V
04XSM1	**Spanish for Intermediate Students M1** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	Z	V
04XSM2	**Spanish for Intermediate Students M3** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	L	V
04XSM3	**Spanish for Intermediate Students M3** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	Z	V
04XSP1	**Spanish for Advanced Students P1** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	Z	V
04XSP2	**Spanish for Advanced Students P2** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	L	V
04XSP3	**Spanish for Advanced Students P3** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+2	Z	V
04XSZ1	**Spanish for Beginners Z1** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+4	L	V
04XSZ2	**Spanish for Beginners Students Z2** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+4	Z	V
04XSZ3	**Spanish for Beginners Z3** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+4	L	V
04XSZ4	**Spanish for Beginners Z4** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+4	Z	V
04XSZ5	**Spanish for Beginners Z5** *Beatriz Vadillo Gonzalo* Beatriz Vadillo Gonzalo (Gar.)	Z	2	0+4	L	V

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

04XAM1	English for Intermediate Students M1	Z	2
The course is designed for students who have successfully completed the full secondary school English language course at least at the A2 level of the Common European Framework of Reference for Languages (CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into fundamentals of vocabulary and style typical of professional oral and written communication situations. Thus it covers topics related to the student´s life and needs as well as topics of subtechnical interest. Attention is also paid to extending the knowledge of grammar issues used in EAP.			
04XAM2	English for Intermediate Students M2	Z	2
The AM2 course expects the student to have completed the AM1 course. It develops their skills for work with subtechnical texts, focusing also more on specific grammar, functions, and lexical items typical of ESP and EAP (e.g., definition, existence and classification of phenomena, object descriptions). Part of the course is also guided writing. If necessary, grammar revision is included.			
04XAM3	English for Intermediate Students M3	Z	2
The course develops the skills that enable students to cope with features typical of professional style. Increasing attention is paid to developing subtechnical vocabulary and independent understanding of professional texts. Great emphasis is placed on distinguishing different levels of formal and informal oral and written communication and their appropriate Czech equivalents. The course also includes studying abstracts and rules for writing them as well as basic rules for preparing and giving a short presentation on a chosen topic related to the student´s field.			
04XAP1	English for Advanced Students P1	Z	2
The course is designed for students who have successfully completed the full secondary school English language course (at least the B1 level of the Common European Framework of Reference for Languages - CEFR). It provides an introduction into English for Specific and Academic Purposes (ESP, EAP), i.e., into the fundamentals of vocabulary, functions, grammar, and style typical of professional oral and written communication situations (fundamentals of terms in mathematics and physics, definitions, graph descriptions, etc). It also covers professional oral and written communication on topics related to the undergraduate´s life and needs. It develops skills for free professional writing (writing a CV, letter of application, polite request). If necessary, revision of selected grammar topics is included.			
04XAP2	English for Advanced Students P2	Z	2
The AP2 course is based on AP1, thus extending the student´s skills for working with subtechnical texts, and even with professional texts of chosen branches of science. According to the students´ needs it concentrates on chosen grammar topics, but mainly intends to develop understanding of syntactic structures and typical rhetorical functions (e.g., various types of descriptions, and, if possible, a case study). Increasing emphasis is placed on the undergraduate´s independent work with and reading of linguistically more demanding materials. The course extends the student´s subtechnical vocabulary, and includes fundamental notions of chosen branches of science. It is focused on formal writing including the sentence and paragraph structure, linking, cohesion and coherence in texts.			

Code	Course Name		Z	2

04XAP3	English for Advanced Students P3		Z	2

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

04XCESZ1	Czech for Foreigners - Beginners 1		Z	2

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

04XCESZ2	Czech for Foreigners - Beginners 2		Z	2

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

04XCESZ3	Czech for Foreigners - Beginners 3		Z	2

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

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 za áte ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar.

04XFZ2	French for Beginners Z2	Z	2

The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty.

04XFZ3	French for Beginners Z3	Z	2

The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts.

04XFZ4	French for Beginners Z4	Z	2

The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet.

04XFZ5	French for Beginners Z5	Z	2

All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive.

04XNM2	German for Intermediate Students M2	Z	2

The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).

04XNM1	German for Intermediate Students M1	Z	2

The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability.

04XNM3	German for Intermediate Students M3	Z	2

The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).

04XNP1	German for Advanced Students P1	Z	2

This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning.

04XNP2	German for Advanced Students P2	Z	2

The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech).

04XNP3	German for Advanced Students P3	Z	2

The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German.

04XRM1	Russian for Intermediate Students M1	Z	2

The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable.

04XRM2	Russian for Intermediate Students M2	Z	2

The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable.

04XRM3	Russian for Intermediate Students M3	Z	2

The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable.

04XRP1	Russian for Advanced Students P1	Z	2

The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills.

04XRP2	Russian for Advanced Students P2	Z	2

The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication.

04XRP3	Russian for Advanced Students P3	Z	2

The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics.

04XRZ1	Russian for Beginners Z1		Z	2
The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it.				
04XRZ2	Russian for Beginners Z2		Z	2
The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.				
04XRZ3	Russian for Beginners Z3		Z	2
The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking.				
04XRZ4	Russian for Beginners Z4		Z	2
The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals.				
04XRZ5	Russian for Beginners Z5		Z	2
The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.)				
04XSM1	Spanish for Intermediate Students M1		Z	2
The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them.				
04XSM2	Spanish for Intermediate Students M3		Z	2
The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet.				
04XSM3	Spanish for Intermediate Students M3		Z	2
The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination.				
04XSP1	Spanish for Advanced Students P1		Z	2
Course concentrates on more difficult grammar topics, revision of vocabulary, basics of Spanish for specific purposes as well as written communication. Course prerequisites: level B2 of CEFR.				
04XSP2	Spanish for Advanced Students P2		Z	2
Course 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
00MAM1	Essentials of High School Course 1	Z	1
	Students are introduced to mathematical concepts and methods used in the introductory physics course.		

Code	Name	Type	Credits
00MAM2	**Essentials of High School Math Course 2** Review of basics of high school mathematics.	Z	1
00PT	**Preparatory Week**	Z	2
00RET	**Rhetoric** 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.	Z	1
01ANB3	**Calculus B 3** 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.	Z,ZK	8
01ANB4	**Calculus B 4** [1] Diferenciální po et funkcí více prom nných a funkcionálních vektor . [2] Funkce zadané implicitn . [3] Taylorovy ady funkce více prom nných. [4] Regulární zobrazení, zám na prom nných, nekartézské soustavy sou adnic. [5] Lokální, vázané a globální extrémy funkce více prom nných. [6] Základy teorie míry a obrys konstrukce Lebesgueovy míry. [7] Integrální po et funkce více prom nných - Riemann v a Lebesgue v integrál, základní vlastnosti, Fubiniova v ta, v ta o substituci. Leviho a Lebesgueova v ta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po k ivkách a plochách. Integrální v ty.	Z,ZK	6
01FKO	**Functions of Complex Variable** The course starts from outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable are explained in detail: the derivative of a complex function and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, Cauchy's integral theorem, Morera's theorem, roots of a holomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy estimates, Laurent series, residue theorem.	Z,ZK	3
01LAL	**Linear Algebra 1** 1. Vector space. 2. Linear dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6. Matrices of linear mappings. 7. Frobenius theorem.	Z	2
01LAL2	**Linear Algebra 2** Outline: 1. Inverse matrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. Hermitian and quadratic forms. 5. Scalar product and orthogonality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of inverse matrices. 2. Methods of calculation of determinants. 3. Calculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and orthogonality. Calculation of orthogonal complements. 6. Geometry exercises and examples. 7. Adjoint operators.	Z,ZK	4
01LALZ	**Linear Algebra 1, exam**	ZK	2
01MAN	**Calculus 1** Basic calculus (real analysis, functions of one real variable, differential calculus).	Z	4
01MAN2	**Calculus 2** 1. Continuation of differential calculus: Taylor´s Polynomials, Taylor´s formula 2. Infinite series: criteria of convergence, operations on series, absolute and conditional convergence 3. Real and complex power series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. Theory of integrals: primitives, definite integral (Riemann definition), techniques of integration and application of integrals, Generalized Riemann integral	Z,ZK	8
01MANZ	**Calculus 1, exam**	ZK	4
01PRST	**Probability and Statistics** It is a basic course of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolmogorov definition. The notions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and proved. On the basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained.	Z,ZK	4
01RMAF	**Equations of Mathematical Physics** 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).	Z,ZK	7
02BPQT1	**Bachelor Thesis 1** Bachelors thesis on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Supervision and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.	Z	5
02BPQT2	**Bachelor Thesis 2** Bachelors thesis on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Supervision and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.	Z	10
02DEF1	**History of Physics 1** Physics and its place in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Physics in 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.	Z	2
02DEF2	**History of Physics 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.	Z	2
02DPD1	**Detectors and Principles of Detection 1** Abstract: The lectures introduce the main forms of interaction of some particles with matter. The goal is that the student gets an overview of what type of processes are possible and in which situations they may be dominant. Some applications to Medicine and to study the fundamental structure of matter are presented.	ZK	2
02DPD2	**Detectors and Principles of Detection 2** Abstract: The lectures introduce the main ideas needed to understand how detector systems work. It will be focused on gaseous detecting principles, scintilating principles and semiconductor detecting principles. Basic information about various detector constructions is provided.	ZK	4
02ELMA	**Electricity and Magnetism** 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.	Z,ZK	6

Code	Subject	Type	Credits
02EXF	Experimental Physics	ZK	2
The goal of this subject is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are used for such measurements, and the analysis of measured data.			
02FYS1	Physical Seminar 1	Z	2
The seminar is devoted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physics presented in the course of Mechanics. The problems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equipments.			
02KM1	Quantum Mechanics 1	Z,ZK	6
Abstract: The lecture describes the birth of quantum mechanics and description of one particle and more particles by elements of the Hilbert space as well as its time evolution. Besides that it includes description of observable quantities by operators in the Hilbert space and calculation of their spectra.			
02KM2	Quantum Mechanics 2	Z,ZK	6
Abstract: The lecture expands the introduction to quantum mechanics with more general formalism of quantum theory, approximate methods and path integral. It summarizes the terminology and methods used in various applications of quantum mechanics and prepares the students for an effective scientific research and further study, in particular, of the modern formulations of quantum field theory.			
02KPRA2	Quantum Laboratory 2	KZ	4
Physical measurements designed to master the operation of devices used in physics and technology dealing with experiments at the quantum level. Experiments are chosen such that the student will become accostumed with demanding parts of experimental physics and demonstrate quantum effects.			
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.			
02NSAD1	Simulations and Data Analysis Tools 1	Z	2
Data analysis and simulations of high energy elementary particle collisions. ROOT and Pythia programs.			
02NSAD2	Simulations and Data Analysis Tools 2	Z	2
Individual work will include implementation and testing of a program for generating of particle collision. Results are reviewed.			
02PRA1	Experimental Laboratory 1	KZ	6
Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with theliterature), the implementation of the measurement (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluation of results. At the same time practically extendthe knowledge gained in lectures on physics.			
02PRA2	Experimental Laboratory 2	KZ	6
Lecture is intended especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear Engineering). But it can be also attended by students interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with theliterature), the implementation of the measurement (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluation of results. At the same time practically extendthe knowledge gained in lectures on physics.			
02STR	Special Theory of Relativity	ZK	2
Students extend their knowledge of classical, non-quantum mechanics of the special theory of relativity fundamentals.			
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 different 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).			
02TEF2	Theoretical Physics 2	Z,ZK	4
Tensors and transformations in physics. Mechanics of point mass, rigid body and continuum. The special theory of relativity: relativistic mechanics and classical field theory in the Minkowski space-time. Classical electrodynamics: Maxwell's equations in the Minkowski space-time, electromagnetic waves in dielectric media, electromagnetic radiation in the dipole approximation.			
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.			
02UKT	Introduction to Quantum Theory	Z	2
The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.			
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.

04XCESM3	Czech for Foreigners - Intermediate 3	Z	2

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

04XCESMZK	Czech for Intermediate Students Examination	ZK	4

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

04XCESP1	Czech for Foreign Students - Advanced 1	Z	2

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

04XCESP2	Czech for Foreigners - Advanced 2	Z	2

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

04XCESP3	Czech for Foreigners - Advanced 3	Z	2

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

04XCESPZK	Czech for Foreign Students - Advanced Examination	ZK	4

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

04XCESZ1	Czech for Foreigners - Beginners 1	Z	2

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

04XCESZ2	Czech for Foreigners - Beginners 2	Z	2

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

04XCESZ3	Czech for Foreigners - Beginners 3	Z	2

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

04XCESZZK	Czech for Foreigners Beginners - Examination	ZK	4

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

04XFM1	French for Intermediate Students M1	Z	2

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

04XFM2	French for Intermediate Students M2	Z	2

Course FM2 builds on FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science texts, features typical for technical and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology, French scientists, artists and architects. Description of an object, device, shapes, dimensions, material.

04XFM3	French for Intermediate Students M3	Z	2

The course is focused on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (subordinate and infinitive clauses, participle structures, compound tenses). Text summary. -Students prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is linked to the field of students´ future specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative work compiled from French articles and one´s own knowledge/experience. -Longer monologues on topics /situations set for the examination are prepared. Text structure, cohesion and coherence.

04XFMZK	French for Intermediate Students Examination	ZK	4

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

04XFP1	French for Advanced Students P1	Z	2

FP advanced course The objective of this three-semester course is to improve and further develop communication in the French language in both written and oral form. Students will be able to communicate in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit general and technical information and to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded: subjonctif, passé composé-imparfait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactional letters, CV, personal statement, request, answer to an advert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topics of specialization: mathematics, internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation.

04XFP2	French for Advanced Students P2	Z	2

With the link to P1 contents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication on given topics. Features typical of technical and scientific communication are stressed (passive voice, nominalization, word formation).

04XFP3	French for Advanded Students P3	Z	2

The course is focused on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in engineering environment. Special skill - translation of shorter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covers a technical /applied science topic. It is a creative work compiled from 3 French sources. Preparation of several set topics for oral examination.

04XFPZK	French for Advanced Students Examination	ZK	4

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

04XFZ1	French for Beginners Z1	Z	2

French for beginners The objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life , in socializing and in professional life. The course includes French for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able to communicate at elementary level, actively using the knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdová, French for beginners (Francouzština pro za áte ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4 : introductions, personal information, asking and giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and grammar.

04XFZ2	French for Beginners Z2	Z	2

The course is linking up with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the textbook: Pravda - Pravdová : French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement, apology, thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topics covered: How does the machine work? A few expressions concerning the study. Name of University and Faculty.

04XFZ3	French for Beginners Z3	Z	2

The course builts upon FZ2. Basic linguistic knowledge and skills are developed. The contents is given by lessons 14 - 18 of the textbook: Pravda - Pravdová: French for Beginners. Topics, functions and situations are complemented from other materials. Stress is put on oral communication in dialogues and on reading, both for information and loud as part of pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts.

04XFZ4	French for Beginners Z4	Z	2

The course builds up on FZ3. Basic linguistic knowledge and skills are further developed. Oral communication and reading skills are practiced. The contents is roughly covered with lessons 19 - 23 of the textbook French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecture notes French for Engineering Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, university in our country and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet.

04XFZ5	French for Beginners Z5	Z	2

All four skills acquired in FZ4 are further developed, as well as technical language. Students prepare a paper on a chosen popular science topic. They present it orally in the class. The general contents is covered by lessons 24 - 26 of the textbook: Pravda-Pravdova, French for Beginners, and is complemented from other materials. Topics: on physics from lecture notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conjunctions, subjunctive clauses, gerund, passive.

04XFZZK	French for Beginners Examination	ZK	3
The content is the examination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The examination is ruled by the document Instruction for examination. Its content covers the levels FZ1 - FZ5.			
04XNM1	German for Intermediate Students M1	Z	2
The objective of the course is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena and structures (e.g. the passive) and word formation processes (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Republic and Germany, current environmental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamentals of IT terminology. It develops communication on related topics and is aimed at correct pronunciation, grammatical correctness and understandability.			
04XNM2	German for Intermediate Students M2	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNM3	German for Intermediate Students M3	Z	2
The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and society, the world at the beginning of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and car technology etc. Students practise reading for information and reading aloud, and appropriate language for various purposes in oral and written communication. The course systematically revises other grammatical phenomena important for professional discourse (participles, relative clauses).			
04XNMZK	German for Intermediate Students Examination	ZK	4
The course content is the examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 assessment. More detailed information is to be obtained from the teacher.			
04XNP1	German for Advanced Students P1	Z	2
This course requires good grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be levelled off at the beginning of the course. The course is then focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for detail). It revises and develops more difficult grammar structures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on practical everyday communication, i.e., telephoning.			
04XNP2	German for Advanced Students P2	Z	2
The course develops the students' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while extending their general and subtechnical vocabulary range. It introduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and practising formal communication, both written and oral (CV, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech).			
04XNP3	German for Advanced Students P3	Z	2
The course consists of 3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a variety of less common situations (traffic problems and car accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the vocabulary range in fields such as nuclear power engineering, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are used. By means of a presentation, students are trained to process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. The course also includes translation practice to and from German.			
04XNPZK	German for Advanced Students Examination	ZK	4
The course content is the examination as given by the study plan. The whole German for Advanced Students Course is completed by an examination consisting of two parts - written and oral, which cover the courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungraded assessment. More detailed information is to be obtained from the teacher.			
04XRM1	Russian for Intermediate Students M1	Z	2
The course is designed for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphabet (both printed and handwritten), basic vocabulary for communication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, asking the way and giving directions), they can use basic grammar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievement level of the RZ2 course. The contents and scope of the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable.			
04XRM2	Russian for Intermediate Students M2	Z	2
The course is based on the RM1 course, its contents and scope correspond roughly to RZ4, however, for half of the time allotted in the timetable.			
04XRM3	Russian for Intermediate Students M3	Z	2
The course develops the knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, however, for half of the time allotted in the timetable.			
04XRMZK	Russian for Intermediate Students Examination	ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RM1 - RM3. Students are eligible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instructions by the teacher.			
04XRP1	Russian for Advanced Students P1	Z	2
The entrance requirement for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, practicing more difficult grammar structures, understanding the fundamentals of technical language and training writing skills.			
04XRP2	Russian for Advanced Students P2	Z	2
The course is based on RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, verb aspects, specific syntactic structures). Stress is put on independent oral and written communication.			
04XRP3	Russian for Advanced Students P3	Z	2
The course is based on RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphrasing, translation). The RP1 - RP3 courses require good previous knowledge of general language at secondary level (listening, reading, correct communication in everyday situations). The courses develop and expand these skills. Further study is aimed at professional and technical skills (reading technical literature according to the students´ specialization, oral and written interpretation). Students develop their subtechnical vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write accurately and with confidence on technical topics.			
04XRPZK	Russian for Advanced Students Examination	ZK	4
The course content is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowledge and skills acquired in RP1 - RP3. Students are eligible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instructions by the teacher.			

04XRZ1	Russian for Beginners Z1	Z	2

The course represents the first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Russian. Thus it begins with mastering the Russian alphabet (for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaking). Students will be able to read a short text with marked stress, understand its contents and summarize it.

04XRZ2	Russian for Beginners Z2	Z	2

The second semester of the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short subtechnical texts. Students will be able to communicate using short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will also develop their vocabulary and master further grammatical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.

04XRZ3	Russian for Beginners Z3	Z	2

The course is based on RZ2 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for training various forms of reading skills and listening) and introduces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be able to respond so as to be understood, and to express their opinion. Writing skills will be trained on guided writing tasks and note-taking.

04XRZ4	Russian for Beginners Z4	Z	2

The course is based on RZ3. It improves and expands the knowledge of general language in all four skills (reading and understanding longer texts with a certain percentage of unfamiliar words, oral communication in everyday situations, writing longer texts). Students are trained to use grammar structures effectively (e.g., irregular verbs, differences in verb patterns from Czech, modality, imperatives, conditionals). They practice and develop communication skills for everyday situations (food, travelling, free time), and practice oral and written communication on more specific topics (environment, addictions, the green movement). They become acquainted with various geographical data (e.g., Siberia), learn how to fill in forms, look up the information from the timetable, learn about Russian holidays and typical meals.

04XRZ5	Russian for Beginners Z5	Z	2

The course expects the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understanding, extracting and summarizing information from a specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Communication skills are trained on everyday topics. Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (verbal adjectives, participles, passive voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, polite request, etc.)

04XRZZK	Russian for Beginners Examination	ZK	3

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

04XSM1	Spanish for Intermediate Students M1	Z	2

The course is designed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semester course develops standard vocabulary and pays attention to further grammar topics (e.g., perífrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negative form of the imperative, and subjunctive), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading texts or listening to them.

04XSM2	Spanish for Intermediate Students M3	Z	2

The course develops the students´ knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for specific purposes in order to be able to work with specialized texts on the Internet.

04XSM3	Spanish for Intermediate Students M3	Z	2

The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with the peculiarities of academic style. They will be competent enough to use the Internet in Spanish and search for information of their specialization or field of interest. Students will use the information to write short articles and summaries. The final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral examination.

04XSMZK	Spanish for Intermediate Students Examination	ZK	4

The course content is the examination as given by the study plan. 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.

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.

Code	Course	Type	Credits
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.		
11KPRA1	Quantum Laboratory 1	KZ	4
	In the first part of the semester, the students will gain basic practical skills in laser physics and usually used measurement methods and techniques. In the second part the students will focus on tasks in preparation of low-dimensional systems, physics of low temperatures and basic structure and spectroscopic methods of solid state physics.		
11SFIPL	Seminar on Solid State Physics	KZ	2
	1.Introduction of the Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations of diffractive phenomena related to following themes: crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, atomic scattering factor, structural factor, extinction, practical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorder on diffraction pattern, atomization and thermal oscillations, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and standing waves, normal modes, polarization, energy and momentum transport, infinite chain, chain of finite lenght, boundary conditions, wave packets, group and phase velocity, dispersion, pulses and their propagation, localized modes, anharmonicity 8."debye" module - lattice dynamics and thermal capacity ? theory 9.Simulations: Brillouine zone, dispersion relation, density of states, thermal energy, heat capacity 10."drude" module - dynamics of classical electron gas in 2D ? theory 11.Simulations: diffuse electron movement, electron drift in an external electric field, Haynes and Shockley experiment, electron mobility, electron motion in magnetic field, cyclotron frequency, Hall experiment, magnetorezistence 12.Assignment, elaboration and presentation of the seminar work.		
11UFP	Introduction to Solid State Physics	ZK	3
	The course contains the fundamentals of diffraction stress analysis with a strong emphasis on the illustrations of the capability of X-ray diffraction to solve engineering problems.		
11UFPLN	Introduction to Solid State Physics	ZK	2
	The purpose of this lecture is to introduce the undergraduate students to the study of the solid state physics.		
11ZFP	Basic to Solid State Physics	ZK	3
	Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids		
11ZFPL	Basic to Solid State Physics	KZ	2
	Description of fundamental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding interaction between atoms in solids, various types of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic thermal properties of crystals are derived. The periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in solids by means of electron energy bands explained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to systematically introduce and interpret a broad phenomenological basis of physical properties of crystalline solids		
12KOE	Fundamentals of Classical Optics and Electrodynamics	ZK	4
	The lecture is focused on the basics of classical optics and electrodynamics, which is important especially in relation to quantum optical theory. The lecture deals with electromagnetic theory, physical optics, material aspects of optical phenomena, introduction to geometrical optics, and fundamentals of nonlinear optics, including dispersion theory of linear and nonlinear response in optical media, including anisotropic ones. Attention is also given to beam optics. Further, it focuses on the implications of statistical properties of light, explains the basics of diffraction theory and holography. It explains the relation between wave optics and ray optics, describes light propagation in term of rays, and outlines the fundamentals of instrumental optics. It also includes the basics of guided waves and resonators - the theory of guided waves in waveguides and optical fibers, waveguide modes and waveguide dispersion, reciprocity theorem and optical resonator theory.		
12LAS	Laser Systems	Z,ZK	3
	Pulsed solid state nanosecond lasers. Picosecond lasers. High energy laser systems. Laser fusion. Diode-pumped solid state lasers. Tunable lasers. Optical parametric generators and raman lasers. Semiconductor lasers for pumping of solid state lasers and diode pumped solid state lasers Amplified spontaneous emission. Ultraviolet lasers. X-ray lasers. High power continuous lasers. Infrared high power lasers. Submilimeter lasers. Lasers with high degree of coherence. Free electron lasers.		
12MOF	Molecular Physics	ZK	2
	Basic ideas on physics of molecules and molecular matter, and on structure-to-physical properties relationship. Methods of molecular structure determination.		
12NME1	Numerical Methods 1	Z,ZK	4
	There are explained the basic principles of numerical mathematics important for numerical solving of problems important for physics and technology. Methods for solution of tasks very important for physicists (ordinary differential equations, random numbers) are included in addition to the basic numerical methods. Integrated computational environment MATLAB is used as a principle programming language as a demonstration tool. The seminars are held in computer laboratory.		
12PYTH	Scientific Programming in Python	Z	2
	The aim of this course is to learn the fundamentals of the modern Python programming language with a focus on scientific computing. Emphasis is placed on effective solutions to real problems. The course is performed in an interactive form of practical exercises, whose topics can be tailored to the content of other subjects or student theses. Students are also involved in ongoing research. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented or functional programming. The greater part of the course focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciPy and the Matplotlib graphics library. We show how to generate efficient code, how to combine Python with other languages, what tools are available.		
12UFN	Introduction to Photonics and Nanostructures	KZ	3
	Overview of nanostructures and nanotechnologies; quantum technologies; quantum nanostructures; photonic structures; nanophotonics and nanoplasmonics; optical waveguides and fibers; integrated photonics; computer simulations; technological realization; student presentations		
12ULAT	Introduction to Laser Technique	KZ	2
	Overview of electromagnetic radiation sources; laser principle; classification of lasers; characterization and rough application of various types of lasers; laser safety precautions. The laser amplifier, Q-switching, mode-locking.		
12UMF	Introduction to Modern Physics	Z	3
	The course is intended to be a concise introduction to modern / nonclassical physics for students who have already had basic classical physics course. A part of the course is delivered in a computational 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 configuation of a computer. Network services: hardware sharing, mail, scp, etc. Network applications		

Code	Name		Completion	Credits
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.				
12VKT	Vacuum Technology		KZ	4
Rarefied gasses: basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surface; sorption, desorption; gas transport through solid matter; evaporation, condensation;Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their properties:-Positive displacement pumps: Diaphragm, Sliding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorption pumps, Sublimation and NEG pumps, Ion getter pumps..Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Materials and vacuum components and seals.Practical exercises.				
12VTV	Scientific and Technical Computing		Z	2
The students get familiar with methods of solving of computational problems in the scientific and technical practice, and with methods of their programming. The course is oriented mainly to programming in the Fortran language.				
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.				
12ZFS	Fundamentals of Photonic Structures		Z,ZK	2
The lecture covers the basics of photonic structures, it classifies photonic structures compares them with the electronic structures, summarizes their preparation and characterization. Specifically, the lecture discusses the basic physics and technology of optical waveguides; it introduces basic linear, nonlinear, and active structures of integrated photonics for applications in optical communications and sensors. Next, the attention is given to introduction of plasmonic structures and plasmonics, periodic structures and photonic crystals, metamaterials, metasurfaces, and finally to photonic structures for quantum technologies. Finally, the lecture is closed with student presentations on selected relevant topics and excursions to selected photonic laboratories.				
12ZPLT	Basic Laser Technique Laboratory		KZ	6
Lasers, solid state Nd:YAG laser, laser crystal, laser discharge lamp, laser cavity, resonator, free-running, Q-switching, laser amplifier. second harmonic, He-Ne glow discharges, laser diode, diode pumped Nd:YAG laser, CO2 laser marking, laser materials properties, non-linear transmission, laser beam transverse profile, acousto-optic modulators.				
14TED	Creating Electronic Documents		Z	2
Basic skills for creating and presenting student theses. Individual exercises focus on creating and formatting texts, equations, charts, tables, presentations and entire documents in an office suite.				
15CH1	General Chemistry 1		Z	3
The most important concepts, quantities and units used in chemistry are introduced in the course General Chemistry I. Their significance and practical use are illustrated by examples solved in exercises.				
15CH2	General Chemistry 2		Z,ZK	3
The subject is the continuation of the course General chemistry I. The main attention is paid to general principles governing chemical processes. Using various examples, the fact that the validity of these principles is not restricted only to chemical processes is documented. The significance and practical use of explained principles are illustrated by examples solved in exercises.				
17UING	Introduction to Engineering		KZ	3
This course provides introduction to engineering skills. Students should gain general engineering skills at basic level (e.g. material properties and behavior, basics of manufacturing and production, quality assurance, environmental impacts,). In addition, the introduction to scientific work and technical drawing will be included.				
18NES2	Neural Networks 2		KZ	3
The aim of the course "Neural Networks 2" is to acquaint students with basic models of deep neural networks and teach them how to apply these models and methods to solve practical tasks.				
18PPY1	Programming in Python 1		Z	2
This course introduces students to advanced features of the Python language and common scientific packages. The course covers both object-oriented as well as functional programming paradigms. The following part of the course describes the use of Python in the fields of scientific and technical computing (NumPy and SciPy packages), data processing and visualization.				
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.				
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

For updated information see http://bilakniha.cvut.cz/en/FF.html
Generated: day 2025-07-03, time 22:19.