## Study plan

## Name of study plan: Kvantové technologie

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:

	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)					
02DEF1	History of Physics 1 Igor Jex, Miroslav Myška Miroslav Myška Igor Jex (Gar.)	Z	2	2+0	Z	Р
02ELMA	Electricity and Magnetism Iskender Yalcınkaya, Goce Chadzitaskos, Josef Schmidt, Jan Vysoký Jan Vysoký Goce Chadzitaskos (Gar.)	Z,ZK	6	4+2	L	Р
01LAL	Linear Algebra 1 Petr Ambrož, Lubomíra Dvo áková Lubomíra Dvo áková (Gar.)  Dvo áková (Gar.)	Z	2	2P+2C		Р
01LALZ	Linear Algebra 1, exam Petr Ambrož, Lubomíra Dvo áková Lubomíra Dvo áková (Gar.)	ZK	2	0P+0C		Р
01LAL2	Linear Algebra 2 Petr Ambrož, Lubomíra Dvo áková Lubomíra Dvo áková (Gar.)	Z,ZK	4	2P+2C		Р
01MAN	Calculus 1 Miroslav Kolá, Pavel Strachota, Edita Pelantová Pavel Strachota Edita Pelantová (Gar.)	Z	4	4+4		Р
01MANZ	Calculus 1, exam Miroslav Kolá, Pavel Strachota, Edita Pelantová Pavel Strachota Pavel Strachota (Gar.)	ZK	4	0P+0C		Р
01MAN2	Calculus 2 Severin Pošta, Miroslav Kolá, Edita Pelantová Miroslav Kolá Severin Pošta (Gar.)	Z,ZK	8	4P+4C		Р
02MECH	Mechanics Iskender Yalcinkaya, David B e Michal Jex David B e (Gar.)	Z	4	4+2	Z	Р
02MECHZ	Mechanics - Examination Iskender Yalcinkaya, Goce Chadzitaskos, David Be, Filip Petrásek, Stanislav Skoupý, Antonín Hoskovec, Petr Novotný Antonín Hoskovec David Be (Gar.)	ZK	2	-	Z	Р
00PT	Preparatory Week Petr Ambrož, Milan Krbálek Petr Ambrož Petr Ambrož (Gar.)	Z	2	týden	Z	Р
02TER	Heat and Molecular Physics Filip Petrásek Petr Novotný Petr Jizba (Gar.)	Z,ZK	4	2+2	L	Р
02ZM1	Foundations of Physical Measurements 1 Solangel Rojas Torres, Libor Škoda, Petr Chaloupka Martin Štefa ák Petr Chaloupka (Gar.)	ZK	2	2P+0C	Z	Р

	Virius (Gar.)		
Characteristics	of the courses of this group of Study Plan: Code=BSPQT1 Name=BS P_QTB 1st year	,	
02DEF1	History of Physics 1	7	2
	e in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek	natural philosophers. Aristot	_
	chimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kep		-
•	nce. Newton and his work.	,,, g	
D2ELMA	Electricity and Magnetism	Z.ZK	6
	lomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and	1 / 1	_
-	nic forces, magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, ac currents. Electromagnetic waves,	<del>-</del>	or the relativ
1LAL	Linear Algebra 1	Z	2
	near dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6.		· <del></del>
. vector space. 2. Li neorem.	near dependence and independence. 5. basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6.	watrices of lifteat mappings.	7. Flobellius
	I the sear Almahan Allandara	71/	
1LALZ	Linear Algebra 1, exam	ZK	2
1LAL2	Linear Algebra 2	Z,ZK	4
	atrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. He	· · · · · · · · · · · · · · · · · · ·	
•	nality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of		
	alculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and c	orthogonality. Calculation of o	rthogonal
	ometry – exercises and examples. 7. Adjoint operators.		
1MAN	Calculus 1	Z	4
asic calculus (real	analysis, functions of one real variable, differential calculus).		
1MANZ	Calculus 1, exam	ZK	4
1MAN2	Calculus 2	Z,ZK	8
Continuation of dif	ferential calculus: Taylor's Polynomials, Taylor's formula 2. Infinite series: criteria of convergence, operations on serie:	s absolute and conditional co	onvergence :
	ower series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. The		ŭ
	, techniques of integration and application of integrals, Generalized Riemann integral	neory or integrals. primitives,	demine mic
2MECH	Mechanics	Z	4
		-	•
	s, physical quantities and units. Particle kinematics, basic types of motion and theirsuperposition. Particle dynamics, of the provided in the provided the provided forms. Machanics of suctom of two particles, two back problems as likely and provided the provided forms.	•	
	forces innoninertial reference frames. Mechanics of system of free particles, two-body problem, collisions. Mechanics is, elasticity, hydrodynamics. Sound.	orngia body, rotation. Funda	illelitais oi
		71/	
2MECHZ	Mechanics - Examination	ZK	2
	ubject is the examination according to the plan of studies.		
0PT	Preparatory Week	Z	2
2TER	Heat and Molecular Physics	Z,ZK	4
hermal expansion of	of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd t	hermodynamic principle, idea	al and real g
ntropy; non-chemic	al systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwel	l's velocity distribution, equipa	rtition theore
2ZM1	Foundations of Physical Measurements 1	ZK	2
he lecture is design	ned for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering)	), however, it can be attended	by students
ther 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. Stude	ents learn th
asic habits of work		,	
2ZM2	Foundations of Physical Measurements 2	KZ	4
	ned for students of physical specializations (Experimental particle physics, Physical engineering, Nuclear engineering)	1	
•	goal of the lecture is to introduce the basics of physical measurements, the methods of processing and evaluation of		•
asic habits of work		adda on a 1 0. oldad	Juiii (ii
8ZPRO	Basics of Programming	Z	4
		1	-
inis course is intend	led mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts	in programming and with the	= Pytrion

ΚZ

Ζ

0P+4L

4C

4

Ζ

Foundations of Physical Measurements 2
Petr Chaloupka Martin Štefa ák Petr Chaloupka (Gar.)

Maksym Dreval, Vladimír Jarý, Miroslav Virius, Jakub Klinkovský, Petr Pauš, František Vold ich, Jan Tomsa, Zuzana Pet í ková **Miroslav Virius** Miroslav

**Basics of Programming** 

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

programming language.

02ZM2

18ZPRO

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

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, Katarína K ížková Gajdošová, Barbara Antonina Tizeciak, Jaroslav Biel ík Jaroslav Biel ík Jaroslav Biel ík (Gar.)	KZ	6	0+4	Z	Р
02PRA2	Experimental Laboratory 2 Libor Škoda, Jaroslav Biel ík Jaroslav Biel ík (Gar.)	KZ	6	0+4	L	Р

01ANB3	Calculus B 3 Miroslav Kolá, Milan Krbálek Miroslav Kolá Milan Krbálek (Gar.)	Z,ZK	8	4P+4C		Р
01ANB4	Calculus B 4 Ji í Mikyška, Miroslav Kolá , Milan Krbálek Milan Krbálek Milan Krbálek (Gar.)	Z,ZK	6	2P+4C		Р
12NME1	Numerical Methods 1 Pavel Váchal Pavel Váchal (Gar.)	Z,ZK	4	2+2	L	Р
02TEF1	Theoretical Physics 1 Petr Novotný Petr Novotný Igor Jex (Gar.)	Z,ZK	4	2+2	Z	Р
02TEF2	Theoretical Physics 2 Filip Petrásek, Petr Novotný Josef Schmidt Petr Novotný (Gar.)	Z,ZK	4	2+2	L	Р
02TSFA	Thermodynamics and Statistical Physics Igor Jex, Jaroslav Novotný Antonín Hoskovec Igor Jex (Gar.)	Z,ZK	4	2+2	L	Р
12ULAT	Introduction to Laser Technique Helena Jelínková, Jan Šulc Helena Jelínková Helena Jelínková (Gar.)	KZ	2	1+1	Z	Р
02VOAF	Waves, Optics and Atomic Physics Josef Schmidt, Petr Novotný Jan Vysoký Ji í Tolar (Gar.)	Z,ZK	6	4+2	Z	Р

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

02PRA1 Experimental Laboratory 1 K7 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

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

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.

Calculus B 4 01ANR4

[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 Lebesque v integrál, základní vlastnosti, Fubiniova v ta, v ta o substituci. Leviho a Lebesque va ta. Limita, spojitost a derivace integrálu podle parametru. [8] Integrály po k ivkách a plochách. Integrální v ty.

12NME1 Numerical Methods 1

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.

Theoretical Physics 1

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

02TFF2 Theoretical Physics 2 Z,ZK

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

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 used to discusses simple transport phenomena.

12ULAT Introduction to Laser Technique

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

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 toquantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Broglie waves, the Schrodinger equation, stationary states and spectra of finite systems.

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 Michal K elina Martin Štefa ák (Gar.)	Z	5	0P+5C	Z	Р
02BPQT2	Bachelor Thesis 2 Michal K elina Martin Štefa ák (Gar.)	Z	10	0P+10C	L	Р
02KM1	Quantum Mechanics 1 Martin Štefa ák Martin Štefa ák (Gar.)	Z,ZK	6	4P+2C	Z	Р
02KM2	Quantum Mechanics 2 Martin Štefa ák Martin Štefa ák (Gar.)	Z,ZK	6	4P+2C	L	Р
11KPRA1	Quantum Laboratory 1 Ladislav Kalvoda Ladislav Kalvoda (Gar.)	KZ	4	4L	Z	Р
02KPRA2	Quantum Laboratory 2 Jan epila Jan epila (Gar.)	KZ	4	4L	L	Р
01PRST	Probability and Statistics Tomáš Hobza Tomáš Hobza (Gar.)	Z,ZK	4	3+1	Z	Р
01RMAF	Equations of Mathematical Physics Václav Klika Václav Klika Václav Klika (Gar.)	Z,ZK	7	4P+2C		Р
12KOE	Fundamentals of Classical Optics and Electrodynamics Milan Ši or, Ivan Richter, Pavel Kwiecien Pavel Kwiecien Ivan Richter (Gar.)	ZK	4	4P	L	Р

02BPQT1	Bachelor Thesis 1	Z	5
Bachelor's thesis on	he selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, departme	nt head and the d	ean. 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
Bachelor's thesis on	he selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, departme	nt head and the d	ean. 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 ev	volution. Besides
that it includes desc	ption 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 pa	th integral. It sum	marizes the
terminology and met	nods used in various applications of quantum mechanics and prepares the students for an effective scientific research and furthe	r study, in particula	ar, of the modern
formulations of quan	um 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 pa	rt the students
will focus on tasks in	preparation of low-dimensional systems, physics of low temperatures and basic structure and spectroscopic methods of solid s	tate physics.	
02KPRA2	Quantum Laboratory 2	KZ	4
Physical measureme	nts designed to master the operation of devices used in physics and technology dealing with experiments at the quantum level.	Experiments are o	chosen such that
the student will become	me accostumed with demanding parts of experimental physics and demonstrate quantum effects.		
01PRST	Probability and Statistics	Z,ZK	4
It is a basic course of	f probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition a	nd continuina till th	ne Kolmogorov

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

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

Name of the group: BS - Social Sciences

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 1 course

Credits in the group: 0

Note on the group:

Only one of these courses is obligatory.

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

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

Economy in Technology	Z	1				
The course introduces the basics of micro- and macroeconomics.						
Ethics of Science and Technology	Z	1				
Rhetoric	Z	1				
n the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the	e composition of	public speech				
al aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an	integral part of the	ne course.				
Introduction to Law	Z	1				
Introduction to Psychology	Z	1				
	he basics of micro- and macroeconomics.  Ethics of Science and Technology  Rhetoric In the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the last aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an Introduction to Law	he basics of micro- and macroeconomics.  Ethics of Science and Technology  Rhetoric  In the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the composition of all aspects. Stylistics exercises, strategies for coping with stage-fright and a short excursion into the history of rhetoric are an integral part of the Introduction to Law  Z				

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	ZK	4		Z	PV
04XAPZK	English for Advanced Students Examination	ZK	4		Z	PV
04XCESZZK	Czech for Foreigners – Beginners - Examination Jana Ková ová, Slav na Brownová	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 (Gar.)	ZK	4		Z	PV
04XFMZK	French for Intermediate Students Examination	ZK	4		Z	PV
04XFPZK	French for Advanced Students Examination	ZK	4		Z	PV
04XFZZK	French for Beginners Examination  V ra Šlechtová	ZK	3		L	PV
04XNMZK	German for Intermediate Students Examination	ZK	4		Z	PV
04XNPZK	German for Advanced Students Examination	ZK	4		Z	PV
04XRMZK	Russian for Intermediate Students Examination	ZK	4		Z	PV
04XRPZK	Russian for Advanced Students Examination	ZK	4		Z	PV
04XRZZK	Russian for Beginners Examination V ra Šlechtová	ZK	3		L	PV
04XSMZK	Spanish for Intermediate Students Examination	ZK	4		Z	PV
04XSPZK	Spanish for Advanced Students Examination	ZK	4		Z	PV
04XSZZK	Spanish for Beginners Examination V ra Šlechtová	ZK	3		L	PV

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

- that do to the country of the group of class, and country of the								
04XAMZK	English for Intermediate Students Examination	ZK	4					
The course content is the	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 studer	nt is expected to master the AM syllabus and demonstrate the ability to apply their knowledge gained in the three English cou	ırses.						
04XAPZK	English for Advanced Students Examination	ZK	4					
The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained								
in the three AP courses	. The examination consists of 2 parts - written (110 min) and oral (30 min) and includes also oral presentation of a topic from	the student's field	d of study.					

04XCESZZK	Czach for Foreigners Regioners Evamination	ZK	4
	Czech for Foreigners – Beginners - Examination he examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the	1	•
	the examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the coessful completion of all three courses. Detailed information is to be obtained from the teacher.	04ACESZ1,2,3 COUI	ses and can
04XCESMZK	Czech for Intermediate Students Examination	ZK	4
	Ozech for intermediate Students Examination he examination as given by the study plan. The examination consisting of a written and oral part covers all the topics of the		
	ul completion of the 3 courses. Detailed information is to be obtained from the teacher.	CESIVIT,2,3 COUISES	and can only
		71/	
04XCESPZK	Czech for Foreign Students - Advanced Examination	ZK	. 4
	he 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
	ul completion of the 3 courses. Detailed information is to be obtained from the teacher.		
04XFMZK	French for Intermediate Students Examination	ZK	4
	nination as given by the study programme. The whole French programme is ended with an examination covering the conten	ts of FM1-FM3. The	examination
	d oral part and is organized according to Examination Instructions, a document available on the web.	<del></del>	
04XFPZK	French for Advanced Students Examination	ZK	4
	ram is ended with an examination covering the contents of FP1-FP3. The examination consists of a written and/or an oral p	art and is organized	according to
Examination Instruction	is, 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 exar	nination as given by the study plan. The course is terminated with an examination consisting of oral and written part. The ex	amination is ruled by	y the document
nstruction for examina	tion. Its content covers the levels FZ1 - FZ5.		
04XNMZK	German for Intermediate Students Examination	ZK	4
he course content is t	, ne examination as given by the study plan. The whole German for Intermediate Students Course is completed by an examina	ation consisting of tw	o parts - written
and oral, which cover t	ne courses NM1 - NM3. The oral part follows after passing the written part successfully and after obtaining the 04NM3 asse	ssment. More detaile	ed information
s to be obtained from	he teacher.		
04XNPZK	German for Advanced Students Examination	ZK	4
The course content is t	he examination as given by the study plan. The whole German for Advanced Students Course is completed by an examinat	ion consisting of two	parts - written
and oral, which cover t	ne courses NP1 - NP3. The oral part follows after passing the written part successfully and after obtaining the 04NP3 ungra	ded assessment. Mo	ore detailed
nformation is to be obt	ained from the teacher.		
04XRMZK	Russian for Intermediate Students Examination	ZK	4
The course content is t	r he examination as given by the study plan. The course is completed by taking a written and oral examination testing the kno	owledge and skills a	equired in RM1
RM3. Students are el	gible for the oral examination only after a prior pass in RM3 and a successful written examination. Students are given instru	ctions by the teache	r.
04XRPZK	Russian for Advanced Students Examination	<i>7</i> K	4
	he examination as given by the study plan. The course is completed by taking a written and oral examination testing the kno	owledge and skills a	cauired in RP1
	gible for the oral examination only after a prior pass in RP3 and a successful written examination. Students are given instruc	•	•
04XRZZK	Russian for Beginners Examination	ZK	3
	he examination as given by the study plan. The course is completed by taking a written and oral examination testing the kno	1	_
	gible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instruc	-	-
04XSMZK	Spanish for Intermediate Students Examination	ZK	
	Spanish for intermediate Students Examination ne examination as given by the study plan. SMZK examination consists of two parts - written and oral; to be eligible for the writ		H have obtained
	te examination as given by the study plan. SM2K examination consists of two parts - written and oral, to be engine for the written part.	ten part, students wi	ii nave obtained
		71/	
04XSPZK	Spanish for Advanced Students Examination	ZK	4
	ne examination as given by the study plan. Examination SPZK consists of two parts, namely oral and written. The prerequisite	e for admission to ora	al part is having
	Examination content is based on syllabi of courses SP1, SP2, and SP3 or on an individual study plan of the student.	<del></del>	
04XSZZK	Spanish for Beginners Examination	ZK	3
	he 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 exa	nination test.		
ama of the h	locks Floative equipped		

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:

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) History of Physics 2
Igor Jex Miroslav Myška Igor Jex (Gar.) 02DEF2 Ζ 2+0 L **Detectors and Principles of Detection 1** 02DPD1 Solangel Rojas Torres, Jesus Guillermo Contreras Martin Štefa ák Jesus ZK 2 2P+0C Ζ Guillermo Contreras (Gar.) **Detectors and Principles of Detection 2** 4P+0C 02DPD2 ZK Solangel Rojas Torres, Jesus Guillermo Contreras Martin Štefa ák Jesus Guillermo Contreras (Gar.)

02EXF	Experimental Physics Katarína K ížková Gajdošová, Barbara Antonina Trzeciak, Jaroslav Adam,	ZK	2	2P+0C	Z	V
01FKO	Jaroslava Óbertová <b>Jaroslava Óbertová</b> Katarína K ížková Gajdošová (Gar.) <b>Functions of Complex Variable</b> Pavel Š oví ek <b>Pavel Š oví ek</b> Pavel Š oví ek (Gar.)	Z,ZK	3	2+1		V
02FYS1	Physical Seminar 1  Martin Štefa ák Vojt ch Svoboda (Gar.)	Z	2	0+2	Z	V
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 (Gar.)	Z,ZK	3	2+1	L	V
00MAM1	Essentials of High School Course 1  David Be Martin Stefa 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 (Gar.)	Z	2	2P+0C	Z	V
02NSAD2	Simulations and Data Analysis Tools 2 Zden k Hubá ek Zden k Hubá ek (Gar.)	Z	2	2+0		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
11SFIPL	Seminar on Solid State Physics Ladislav Kalvoda Ladislav Kalvoda (Gar.)	KZ	2	1+1		V
02STR	Special Theory of Relativity David Be Martin Štefa ák David Be (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 Aleš Materna (Gar.)	Z	2	26C		٧
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 (Gar.)	Z	2	2+0	Z	V
11UFPLN	Introduction to Solid State Physics Ivo Kraus, Petr Kolenko Petr Kolenko Ivo Kraus (Gar.)	ZK	2	2+0	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 (Gar.)	Z	2	2+0		V
12UMF	Introduction to Modern Physics Jan Pšikal Jan Pšikal (Gar.)	Z	3	2+1	L	٧
12UNXAP	Introduction to UNIX Milan Kucha ik Milan Kucha ik Milan Kucha ik (Gar.)	Z	2	1P+1C	L	٧
12UVP	Introduction to Scientific Computing Milan Ši or Milan Ši or (Gar.)	Z	2	1P+1C	L	٧
12VKT	Vacuum Technology Richard Švejkar Vojt ch Petrá ek Vojt ch Petrá ek (Gar.)	KZ	4	2P+2L	Z	٧
12PYTH	Scientific Programming in Python Pavel Váchal, Jakub Urban <b>Pavel Váchal</b> Pavel Váchal (Gar.)	Z	2	0+2	L	٧
12VTV	Scientific and Technical Computing Ivan Procházka Ivan Procházka (Gar.)	Z	2	1+1	L	٧
12ZPLT	Basic Laser Technique Laboratory Václav Kube ek, Josef Blažej Václav Kube ek (Gar.)	KZ	6	0+4	L	V
12ZEL1	Basic Electronics 1 Jaroslav Pavel Jaroslav Pavel (Gar.)	Z,ZK	3	2+1	Z	V
12ZEL2	Basic Electronics 2 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
11ZFPL	Basic to Solid State Physics Ladislav Kalvoda, Eva Mihóková Eva Mihóková Ladislav Kalvoda (Gar.)	KZ	2	26P+0C	Z	V

## Characteristics of the courses of this group of Study Plan: Code=BSPQTV Name=BS P\_QTB Optional courses

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.

02DPD1 Abstract: The lecture	Detectors and Principles of Detection 1	ZK	0
Abstract: The lecture	201001010 0110 1 111010100 01 2010011011 1	ZN	2
	is introduce the main forms of interaction of some particles with matter. The goal is that the student gets an overview of what ty	pe of processes ar	e possible and
	ney 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
	is introduce the main ideas needed to understand how detector systems work. It will be focused on gaseous detecting principle	es, scintilating princ	iples and
	ting principles. Basic information about various detector constructions is provided.	717	
02EXF	Experimental Physics	ZK	2
analysis of measure	ect is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are use	ed for such measur	ements, and tr
01FKO	Functions of Complex Variable	Z.ZK	3
	m outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable a	1 '	_
	n and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, C	•	
•	olomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy		
theorem.			
02FYS1	Physical Seminar 1	Z	2
The seminar is devo	ted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physical problems.	ics presented in the	e course of
Mechanics. The prol	olems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equ	uipments.	
04AKS	English Conversation	Z	1
	lop the student's communication skills acquired throughout their previous studies. It aims to improve all aspects of oral commu		
	various communication situations and will master their communication strategy. They will also practise their listening skills in ord		and participate
	student will be trained to express their ideas clearly and according to current English usage, and become a more confident spec		
12LAS	Laser Systems	Z,ZK	3
	anosecond lasers. Picosecond lasers. High energy laser systems. Laser fusion. Diode-pumped solid state lasers. Tunable lasers		-
	emiconductor lasers for pumping of solid state lasers and diode pumped solid state lasers Amplified spontaneous emission. Ult	traviolet lasers. X-ra	ay lasers. High
	sers. Infrared high power lasers. Submillimeter lasers. Lasers with high degree of coherence. Free electron lasers.	7	
DOMAM1	Essentials of High School Course 1	Z	1
DOMAM2	Essentials of High School Math Course 2	Z	1
	high school mathematics.	714	
12MOF	Molecular Physics	ZK	2
	-atomic molecules and molecular matter, and on structure-to-physical properties relations. Methods of molecular structure dete	1	
)2NSAD1	Simulations and Data Analysis Tools 1	Z	2
	mulations of high energy elementary particle collisions. ROOT and Pythia programs.	7	
02NSAD2	Simulations and Data Analysis Tools 2	Z	2
	nclude implementation and testing of a program for generating of particle collision. Results are reviewed.		
I8PRC1	Programming in C++ 1	Z	4
-1 *		'	•
	nainly the C programming language and non-object oriented features of the C++ language.		
18PRC2	Programming in C++ 2	KZ	4
18PRC2 This course covers t	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Template	te Library.	4
18PRC2 This course covers t 11SFIPL	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat Seminar on Solid State Physics	te Library.	4
18PRC2  This course covers to the course of the course to the course to the course of	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat Seminar on Solid State Physics Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations	te Library.  KZ s of diffractive phen	4 2 omena related
18PRC2 This course covers to the course covers to the course covers to the course to the course to the course to the course the course to the course the c	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat Seminar on Solid State Physics Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at	te Library.  KZ s of diffractive phen tomic scattering fac	4  2 omena relatedator, structural
18PRC2 This course covers to the course to the course covers to the course to the cour	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat Seminar on Solid State Physics Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at ctical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorder.	te Library.  KZ s of diffractive phen tomic scattering fac er on diffraction pat	4 2 omena relatedetor, structural tern, atomizati
18PRC2 This course covers to the course to the course covers to the course to the cour	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat Seminar on Solid State Physics Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at	te Library.  KZ s of diffractive phen tomic scattering facer on diffraction patholing waves, normal	2 omena related ctor, structural tern, atomizati al modes,
18PRC2 This course covers to 11SFIPL I.Introduction of the o following themes: actor, extinction, praind thermal oscillationarization, energy	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat  Seminar on Solid State Physics  Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at ctical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disorders, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and star	te Library.  KZ s of diffractive phen tomic scattering facer on diffraction patholing waves, normal tersion, pulses and the	2 omena related tor, structural tern, atomizati al modes, neir propagatio
This course covers to the course to the course covers to the course covers to the course to the cour	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat  Seminar on Solid State Physics  Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at ctical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disordions, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and star and momentum transport, infinite chain, chain of finite lenght, boundary conditions, wave packets, group and phase velocity, dispersions.	te Library.  KZ s of diffractive phen tomic scattering fac er on diffraction pat nding waves, norm ersion, pulses and ti n, density of states,	2 omena relatedotor, structural tern, atomizati al modes, neir propagatio thermal energia.
This course covers to a superior of the control of	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templat  Seminar on Solid State Physics  Seminar and ?SSS? software features. 2.Module "bravais" - crystal structure and X-ray diffraction in 2D ? theory 3.Simulations crystal lattice versus crystal structure, primitive cell, elementary cell, lattice plane, reciprocal grid, Laue and Bragg condition, at ctical structural analysis 4.Module "laue" - Diffraction on perfect and imperfect crystals 5.Simulations: influence of structural disordions, quasi crystals 6."born" module - dynamics of crystalline grid in 1D ? theory 7.Simulations: planar waves, traveling and star and momentum transport, infinite chain, chain of finite lenght, boundary conditions, wave packets, group and phase velocity, dispensar monicity 8."debye" module - lattice dynamics and thermal capacity ? theory 9.Simulations: Brillouine zone, dispersion relation	te Library.  KZ s of diffractive phentomic scattering facer on diffraction patending waves, normersion, pulses and tin, density of states, external electric fie	2 omena relatedotor, structural tern, atomizati al modes, neir propagation thermal energiald, Haynes ar
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8PRC2 This course covers to 1SFIPL Introduction of the properties of following themes: actor, extinction, praying the properties of the pr	Programming in C++ 2 he object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard Templar    Seminar on Solid State Physics	te Library.  KZ s of diffractive phen tomic scattering fac er on diffraction pat nding waves, norms ersion, pulses and ti n, density of states, external electric fie elaboration and pro  ZK	2 omena relate tor, structural tern, atomizati al modes, neir propagati thermal ener eld, Haynes ar esentation of t
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12UMF	Introduction to Modern Physics	Z	3
	o be a concise introduction to modern / nonclassical physics for students who have already had basic classical physics course	e. A part of the co	urse is delivered
in a computational labor	atory.		
12UNXAP	Introduction to UNIX	Z	2
Computer and operating	systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interfar	ce. Hardware and	software.
Principles of operating s	ystems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working	with files. Text ec	ditors: vi, emacs.
Command interpreter (s	hell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard	tools. Graphical ι	user interface
X-windows. Computer ne	etworks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a c	omputer. Network	services:
hardware sharing, mail,	scp, etc. Network applications		
12UVP	Introduction to Scientific Computing	Z	2
Practically oriented Intro	duction to scientific computing. Constituent part of the course is realized in computer classroom. Students get acquinted with	some basic tools	fort scientific
and technicval computin	g, data analysis, data visualisation and algorithm development.		
12VKT	Vacuum Technology	KZ	4
Rarefied gasses: basic of	concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surf	ace; sorption, des	sorption; gas
transport through solid n	natter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their	properties:-Positi	ve displacement
pumps: Diaphragm, Slid	ing vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsor	rption pumps, Sub	olimation and
NEG pumps, Ion getter	pumpsVacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Ma	terials and vacuu	m components
and seals.Practical exer	cises.		
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 pl	aced 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 stude	nt theses. Studen	its are also
involved in ongoing rese	arch. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented o	r functional progra	amming. The
greater part of the cours	e focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciP	y and the Matplot	lib 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 familia	r with methods of solving of computational problems in the scientific and technical practice, and with methods of their prograi	mming. The cours	e is oriented
mainly to programming i	n the Fortran language.		
12ZPLT	Basic Laser Technique Laboratory	KZ	6
Lasers, solid state Nd:Y	AG laser, laser crystal, laser discharge lamp, laser cavity, resonator, free-running, Q-switching, laser amplifier. second harmo	nic, He-Ne glow d	lischarges, laser
diode, diode pumped No	d:YAG laser, CO2 laser marking, laser materials properties, non-linear transmission, laser beam transverse profile, acousto-o	ptic modulators.	
12ZEL1	Basic Electronics 1	Z,ZK	3
The subject provides pri	mary knowledge of circuit theory concerning principles of electronic circuits in both stationary and harmonic stable state. Cir	cuit analysis meth	ods for linear
circuits include symbolic	and complex method are explained. Proper circuit analysis is also lectured. The subject's final part deals with transient effective and complex method are explained.	ts inside linear cir	rcuits.
12ZEL2	Basic Electronics 2	Z,ZK	3
The subject follows up w	rith the Basic Electronics 1. Semiconductor elements basic properties are explained. Thecourse's final part deals with basic t	hemes of logical	circuits field.
12ZFS	Fundamentals of Photonic Structures	Z,ZK	2
The lecture covers the b	asics of photonic structures, it classifies photonic structures compares them with the electronic structures, summarizes their	preparation and	characterization.
Specifically, the lecture of	discusses the basic physics and technology of optical waveguides; it introduces basic linear, nonlinear, and active structures	of integrated phot	tonics for
applications in optical co	ommunications and sensors. Next, the attention is given to introduction of plasmonic structures and plasmonics, periodic stru	ctures and photor	nic crystals,
metamaterials, metasurf	aces, 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

11ZFPL Basic to Solid State Physics

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:

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) 04XAM1 Ζ 2 0+2Ζ **English for Intermediate Students M1** ٧ **English for Intermediate Students M2** 04XAM2 2 L Ζ 0+2 ٧ V ra Šlechtová English for Intermediate Students M3 04XAM3 Ζ 2 0+2Ζ V ra Šlechtová **English for Advanced Students P1** 04XAP1 Ζ 2 Ζ 0+2 ٧ V ra Šlechtová **English for Advanced Students P2** 04XAP2 Ζ 2 0+2L V ra Šlechtová **English for Advanced Students P3** 04XAP3 Ζ 2 0+2 Ζ V ra Šlechtová

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 (Gar.)	Z	2	2S	Z	V
04XCESM1	Czech for Foreigners - Intermediate 1	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  V ra Šlechtová 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 V ra Šlechtová Jana Ková ová (Gar.)	Z	2	0+2	Z	V
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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	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
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04XFP3	French for Advanded Students P3 V ra Šlechtová	Z	2	0+2	Z	V
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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	Z	2	0+4	Z	V
04XFZ5	French for Beginners Z5  V ra Šlechtová	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 V ra Šlechtová Miloslava echová (Gar.)	Z	2	0+2	Z	V
04XNM3	German for Intermediate Students M3  V ra Šlechtová	Z	2	0+2	Z	V
04XNP1	German for Advanced Students P1  V ra Šlechtová 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  V ra Šlechtová	Z	2	0+2	Z	V
04XRM1	Russian for Intermediate Students M1 V ra Šlechtová 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  V ra Šlechtová	Z	2	0+2	Z	V
04XRP1	Russian for Advanced Students P1 V ra Šlechtová 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  V ra Šlechtová	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  V ra Šlechtová 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  V ra Šlechtová	Z	2	0+4	Z	V
04XRZ5	Russian for Beginners Z5  V ra Šlechtová	Z	2	0+4	L	V
04XSM1	Spanish for Intermediate Students M1 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 V ra Šlechtová	Z	2	0+2	Z	٧
04XSP1	Spanish for Advanced Students P1 V ra Šlechtová 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 V ra Šlechtová	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 V ra Šlechtová 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 V ra Šlechtová	Z	2	0+4	Z	V
04XSZ5	Spanish for Beginners Z5 V ra Šlechtová	Z	2	0+4	L	V
04XAM1 Er The course is designed for so of Reference for Languages professional oral and writter extending the knowledge of	e courses of this group of Study Plan: Code=BSPJAZYKYZAI nglish for Intermediate Students M1 students who have successfully completed the full secondary school English language (CEFR). It provides an introduction into English for Specific and Academic Purpose of communication situations. Thus it covers topics related to the student's life and need of grammar issues used in EAP. Inglish for Intermediate Students M2	ge course at least a	t the A2 leve	el of the Comi	abulary and s	tyle typical o
The AM2 course expects the and lexical items typical of Erevision is included.	e student to have completed the AM1 course. It develops their skills for work with sul SP and EAP (e.g., definition, existence and classification of phenomena, object described to the contraction of phenomena, object des		•		cific grammar	functions,
	nglish for Intermediate Students M3 Ils that enable students to cope with features typical of professional style. Increasing a	attention is naid to d	eveloning su	htechnical vo	Z	2 Lindepender
·	hal texts. Great emphasis is placed on distinguishing different levels of formal and info	•			-	-
equivalents. The course also student´s field.	o includes studying abstracts and rules for writing them as well as basic rules for pre	paring and giving a	short prese	ntation on a	chosen topic	related to the
	nglish for Advanced Students P1				Z	2
of Reference for Languages grammar, and style typical o covers professional oral and	students who have successfully completed the full secondary school English languages - CEFR). It provides an introduction into English for Specific and Academic Purpose of professional oral and written communication situations (fundamentals of terms in rewritten communication on topics related to the undergraduate's life and needs. It devery revision of selected grammar topics is included.	es (ESP, EAP), i.e., mathematics and pl	into the fundaysics, defini	damentals of tions, graph	vocabulary, f descriptions,	unctions, etc). It also
04XAP2 Er	nglish for Advanced Students P2				Z	2
the students' needs it conce of descriptions, and, if poss The course extends the stud paragraph structure, linking	n AP1, thus extending the student's skills for working with subtechnical texts, and eventrates on chosen grammar topics, but mainly intends to develop understanding of ible, a case study). Increasing emphasis is placed on the undergraduate's independent's subtechnical vocabulary, and includes fundamental notions of chosen branches, cohesion and coherence in texts.	syntactic structures ent work with and r	and typical eading of lin	rhetorical fur guistically mo	nctions (e.g., ore demandir including the	various types ng materials. sentence and
The AP3 course is based or communication skills and fu	nglish for Advanced Students P3  AP2 and expects the student to work without any guidance with authentic profession inctions (e.g., expressing an opinion, agreement, and objections; taking part in discual given or chosen topic and presenting it. The course places emphasis on distinguis	ssion, note-taking;	summarizin	g, writing an a	abstract) and	, if possible,
	zech for Foreigners - Beginners 1				Z	2
The course is designed for sacquire basic language and	students on the English programme. Students will become acquainted with the main of speaking skills. The course focuses on pronounciation exercises, simple social phrashe course covers roughly lessons 1-5 in "Chcete mluvit" esky" by H. Remediosová ar	ases, and oral and v	written comn	nunication in	the most con	nmon
	zech for Foreigners - Beginners 2	-1	-1		Z	2
communication of frequent	ication competences acquired in CESZ1 are further developed. Students extend thei topics. The course covers roughly lessons 6-10 in "Chcete mluvit esky" by H. Reme	•		, ,	•	
have reached A2 (CEFR) applementation of the control of the contro	zech for Foreigners - Beginners 3				Z	2
The course further develops	s the language and communication competences acquired in the XCESZ1 and XCEs ening grammar, including grammar practice, and introducing Czech culture. Students		_		ng up basic v	ocabulary,
	ise understanding texts in terms of main ideas or looking for specific details in texts.		-	-		s 1".
The course is focused on co	zech for Foreigners - Intermediate 1 rrect pronunciation, important morphological phenomena, prepositional phrases, and	verb forms as well	as on extend	ling the stude	Z ent´s vocabula	2 ary for various
social situations. 04XCESM2 Cz	zech for Foreigners - Intermediate 2				Z	2
The course develops the top	pics covered in CESM1 and is then focused on more difficult grammar phenomena. In abbreviations, abbreviated words, and mathematical terms and formulas.	It practices writing,	speaking, ar	l nd reading sk	1	

in understanding common abbreviations, abbreviated words, and mathematical terms and formulas.

04XCESM3	Czech for Foreigners - Intermediate 3	Z	2
	morphological topics covered earlier and extends the student's knowledge of more difficult language phenomena. It is espect loping the student's writing skills.	ially focused on s	tylistics and
04XCESP1	Czech for Foreign Students - Advanced 1	Z	2
	course is very good knowledge of the Czech language, i.e., communicative competences at least at level B2 of the Common Eu		
	evision of standard language structures, but mainly on practising more complex grammatical structures typical of the style of s	-	
	le of engineering and professional communication, both in spoken and written form. The topics include University Studies and		•
•	n with teachers and faculty administrators.		
04XCESP2	Czech for Foreigners - Advanced 2	Z	2
	e student's knowledge acquired in CESP1 and focuses on difficult language phenomena. It practises working with technical a		
emphasis on individual		na specialist texto	s placing greater
04XCESP3	Czech for Foreigners - Advanced 3	Z	2
	1	= !	_
•	e student's knowledge from CESP2. It includes working with authentic specialist materials, their interpretation and presentation ng skills necessary for professional communication are trained.	on, and, imany, pre	esentation of the
		7	0
04XFM1	French for Intermediate Students M1	Z	2
	M The objective of this three-semester course is to improve and further develop communication in the French language in bo		
	icate in social interaction and in academic, scientific and professional environment. They will be able to use the language to tree	_	
	e problems. FM1 The course builds on and further develops linguistic competence acquired at secondary school. It revises, sy	-	
-	s study. The following topics are covered: University studies in our country and in France, writing of transactional letters, CV, per		
	Iture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work	based on these te	
04XFM2	French for Intermediate Students M2		2
	FM1. Linguistic structures and competence acquired in previous study are systemized and expanded. Reading popular science		
	(passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French scie	ence and technolo	ogy, French
	rchitects. Description of an object, device, shapes, dimensions, material.		
04XFM3	French for Intermediate Students M3	Z	2
	on improvement and further development of linguistic competence acquired during the follow-up courses. Syntactic structures (s		
	mpound tenses). Text summaryStudents prepare a written paper which will be delivered in form of an oral presentation in-cl		
	specialisation or to their interest and generally covers a technical /applied science topic. It is not a translation but a creative w	· ·	n French articles
and one's own knowled	dge/experienceLonger monologues on topics /situations set for the examination are prepared. Text structure, cohesion and c	coherence.	
04XFP1	French for Advanced Students P1	Z	2
FP advanced course TI	ne objective of this three-semester course is to improve and further develop communication in the French language in both wr	itten and oral forn	n. Students will
be able to communicate	e in social interaction and in academic, scientific and work environment. They will be able to use the language to transmit gene	eral 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 re	epeated and expan	nded: subjonctif,
passé composé-imparf	ait, pronouns. The following specific topics are covered: University studies in our country and in France, writing of transactiona	al letters, CV, pers	onal statement,
request, answer to an a	dvert, environmental issues, success of French science and technology, chosen topics from French regional culture, Paris. Topi	cs of specialization	on: mathematics,
internet, physics, chem	istry. Reading of technical and popular science texts, further work with these texts and interpretation.		
04XFP2	French for Advanced Students P2	7	2
With the link to P1 cont	ents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication o	n given topics. Fe	_
	ents, the course further develops language skills. Focus is put on reading popular science texts and on oral communication of communication are stressed (passive voice, nominalization, word formation).	n given topics. Fe	_
	communication are stressed (passive voice, nominalization, word formation).	n given topics. Fe	_
technical and scientific 04XFP3	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3	Z	atures typical of
technical and scientific 04XFP3 The course is focused of	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in	Z engineering envir	atures typical of  2 conment. Special
technical and scientific 04XFP3 The course is focused of skill - translation of sho	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally covered to the communication in the language of the communication in the language.	Z engineering envir	atures typical of  2 conment. Special
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.	Z engineering envir vers a technical /a	atures typical of  2 conment. Special opplied science
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo 04XFZ1	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1	Z engineering envir	2 conment. Special pplied science
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo 04XFZ1 French for beginners TI	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in second	Z engineering envir vers a technical /a  Z socializing and in	2 ronment. Special pplied science 2 professional life.
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo 04XFZ1 French for beginners TI The course includes Fr	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in seench for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able	Z engineering envir vers a technical /a  Z socializing and in to communicate	2 ronment. Special pplied science  2 professional life. at elementary
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo 04XFZ1 French for beginners TI The course includes Fr level, actively using the	French for Advanded Students P3  In systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in one reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1  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 seench for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdo	Z engineering envir vers a technical /a  Z socializing and in to to communicate ová, French for be	2 ronment. Special applied science  2 professional life. at elementary aginners
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative wo 04XFZ1 French for beginners The course includes Frelevel, actively using the (Francouzština pro za	French for Advanded Students P3  In systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in one reter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1  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 sench for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravda texts. PX1 is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions,	Z engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be personal informa	2 ronment. Special applied science  2 professional life. at elementary aginners ation, asking and
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative we 04XFZ1 French for beginners The course includes Frederic level, actively using the (Francouzština pro za giving the directions, si	French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in riter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in sench for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravda text (ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions, mple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation.	engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be personal information and grammar.	atures typical of  2 conment. Special applied science  2 professional life. at elementary aginners attion, asking and
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative we 04XFZ1 French for beginners TI The course includes Fr level, actively using the (Francouzština pro za giving the directions, si 04XFZ2	French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in riter texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in search for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdo ate ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions, mple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation French for Beginners Z2	Z engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be personal informa ion and grammar.	atures typical of  2 conment. Special applied science  2 professional life. at elementary aginners attion, asking and
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative we 04XFZ1 French for beginners TI The course includes Fr level, actively using the (Francouzština pro za giving the directions, si 04XFZ2 The course is linking up	French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in other texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in search for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdo ate ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions, mple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation for Beginners Z2 of with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the scope is given	engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be a personal information and grammar.  Z the textbook: Prav	atures typical of  2 conment. Special applied science  2 professional life. at elementary aginners ation, asking and action.  2 cda - Pravdová:
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative we 04XFZ1 French for beginners TI The course includes Fr level, actively using the (Francouzština pro za giving the directions, si 04XFZ2 The course is linking up French for Beginners	French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in other texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in search for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravdo ate ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions, mple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation for Beginners Z2 with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreements).	engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be a personal information and grammar.  Z the textbook: Pravent - disagreement	atures typical of  2 conment. Special applied science  2 professional life. at elementary aginners ation, asking and contact and a Pravdová: at, apology,
technical and scientific 04XFP3 The course is focused of skill - translation of sho topic. It is a creative we 04XFZ1 French for beginners TI The course includes Fr level, actively using the (Francouzština pro za giving the directions, si 04XFZ2 The course is linking up French for Beginners thanking, travelling, ma	French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in other texts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 ne objective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in search for specific / technical communication and reading of popular science and scientific texts. FZ1 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravda key). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1-4: introductions, mple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation for Beginners Z2 of with FZ1. Elementary linguistic knowledge and communication skills are expanded. The scope is given by lessons 8 - 13 of the Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication is practiced.	engineering envir vers a technical /a  Z socializing and in a to communicate ová, French for be a personal information and grammar.  Z the textbook: Pravent - disagreement	atures typical of  2 conment. Special applied science  2 professional life. at elementary aginners attion, asking and a control of the contro
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technical and scientific  04XFP3  The course is focused of skill - translation of shot topic. It is a creative word.  04XFZ1  French for beginners The course includes Frievel, actively using the (Francouzština pro zargiving the directions, si.)  04XFZ2  The course is linking upperent for Beginners and the directions and spronunciation practice.  04XFZ3  The course builts upon Topics, functions and spronunciation practice.  04XFZ4  The course builds up on lessons 19 - 23 of the test Students of FJFI. The country and in France,  04XFZ5  All four skills acquired ingeneral contents is covered to the second subjunctive clauses, get of the world at the beginn practise reading for information of should be subjunctive clauses, get of the world at the beginn practise reading for informatice.	communication are stressed (passive voice, nominalization, word formation).  French for Advanded Students P3 on systemization and improvement of acquired linguistic competence, skills and knowledge, and their use for communication in the rexts (both from and into the language). Writing of a paper and making oral presentation in-class. The paper generally cover the compiled from 3 French sources. Preparation of several set topics for oral examination.  French for Beginners Z1 en ebjective of this 5-level course is to be able to communicate in French orally and in writing in situations of everyday life, in seen 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 seen 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 seen the respective of this 5-level course is to be able to communicate in French for specific? technical communication and reading of popular science and scientific texts. F21 The objective is to be able knowledge of chosen elementary language. The contents is roughly outlined by lessons 1 - 7 of the textbook Pravda - Pravde date ky). It is extended with situations of communication and functions from the textbook Espaces I, lessons 1 - 8 interventions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciat French for Beginners Z2  If rench for Beginners Z2  If rench for Beginners Z3  French for Beginners Z3  French for Beginners Z4  French for Beginners, and is expanded with topics and functions from other materials. Reading is developed from the lecourse covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shop how to write CV, application, topics in mathematics, reading physics - mechanics, inf	engineering envir vers a technical /a  Z socializing and in the to communicate ová, French for be personal information and grammar.  Z the textbook: Pravent - disagreemenunication. Specific vertos is roughly entered to the personal information and loud to the personal information and loud vertos is roughly entered to the personal information and loud vertos is roughly entered to the personal information on physics auses, typical contact technology entered to the personal information of the personal in	atures typical of  2 conment. Special pplied science  2 professional life. at elementary eginners ation, asking and a control of the second se

04XNM1	German for Intermediate Students M1	Z	2
-	rse is to level off the students´ skills in the German language. The course focuses on revision of more difficult phenomena an es (e.g. importance of verb prefixes). In the lexical part, it covers topics referring to higher education in both the Czech Repu		
· ·	gether with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicis	-	
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
	ther more complex grammatical structures and their application in communication based on technical texts, such as the relation ng of the 21st century, linguistically more demanding texts on the environment, the language of mathematics, computers and		
_	mation and reading aloud, and appropriate language for various purposes in oral and written communication. The course system		
·	or professional discourse (participles, relative clauses).		
04XNP1	German for Advanced Students P1	Z	2
	od grammar knowledge, extended general vocabulary, and good communication skills acquired at secondary school to be le		
	ien focused on working with technical and scientific texts and practising reading techniques (skimming, scanning, reading for tructures necessary for understanding a subtechnical text (passive voice, participles, participle structures) and it also focuses on	•	•
i.e., telephoning.	4	,,	,
04XNP2	German for Advanced Students P2	Z	2
· ·	estudents' skills in working with professional scientific texts (understanding, summarising, note-taking, interpreting) while exten-		
	oduces mathematical expressions and texts of nuclear power engineering. Increasing emphasis is placed on understanding and V, letter of application, interview, scholarship), and more complex grammatical structures (i.e., subjunctive, indirect speech).	a practising forma	communication,
04XNP3	German for Advanced Students P3	Z	2
	3 main parts (general communicative situations, grammar and technical topics). Students will develop their vocabulary in a vi	ariety of less com	mon situations
	r accidents, accident report, filling in a form, complaints). Based on presentations and technical and subtechnical texts, the viscout and subtechnical texts are a substantial and subtechnical texts.		
	ing, the environment, computer science, and car technology, will also be extended. Only authentic professional texts are use process information gained from their reading of complex and difficult texts and present it to the class in a simplified oral form. T	=	•
practice to and from Ge			
04XRM1	Russian for Intermediate Students M1	Z	2
_	for students with previous knowledge of Russian from secondary schools. Students are supposed to know the Russian alphal		-
	nmunication in everyday situations (introductions, socializing, greetings, shopping for food and objects of everyday need, ask nmar structures (verbal and nominal forms, irregular verbs, pronouns). The initial knowledge corresponds to the achievemen		-
	the course correspond approximately to the RZ3 course, but for half of the time allotted in the timetable.	riever of the IVEE	course. The
04XRM2	Russian for Intermediate Students M2	Z	2
	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
in the timetable.	e knowledge and skills acquired in RM1 and RM2 and its contents and scope are roughly at the same level as those of RZ5, h	nowever, for half of	the time allotted
04XRP1	Russian for Advanced Students P1	Z	2
04XRP1 The entrance requirement	ent for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pr	1	l
04XRP1 The entrance requirement structures, understanding	be the for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, prong the fundamentals of technical language and training writing skills.	acticing more diffi	cult grammar
04XRP1 The entrance requirement structures, understandin 04XRP2	ent for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2	racticing more diffi	cult grammar
04XRP1 The entrance requirement structures, understanding 04XRP2 The course is based on	be the for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, prong the fundamentals of technical language and training writing skills.	racticing more diffi	cult grammar
04XRP1 The entrance requirement structures, understanding 04XRP2 The course is based on	ent for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2  RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives,	racticing more diffi	cult grammar
04XRP1 The entrance requireme structures, understandin 04XRP2 The course is based on structures). Stress is pu 04XRP3 The course is based on	nt for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2  RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to nindependent oral and written communication.  Russian for Advanced Students P3  RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra	Z verb aspects, spe	2 ecific syntactic 2 The RP1 - RP3
04XRP1 The entrance requireme structures, understandin 04XRP2 The course is based on structures). Stress is pu 04XRP3 The course is based on courses require good price structure good price structure good price	Intrometer the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2  RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to nindependent oral and written communication.  Russian for Advanced Students P3  RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra revious knowledge of general language at secondary level (listening, reading, correct communication in everyday situations).	Z verb aspects, spe Z sing, translation).	2 ecific syntactic  2 The RP1 - RP3 elop and expand
04XRP1 The entrance requireme structures, understandin 04XRP2 The course is based on structures). Stress is pu 04XRP3 The course is based on courses require good puthese skills. Further students	Interpretation of the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2  RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to on independent oral and written communication.  Russian for Advanced Students P3  RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra revious knowledge of general language at secondary level (listening, reading, correct communication in everyday situations), dy is aimed at professional and technical skills (reading technical literature according to the students' specialization, oral and	Z verb aspects, spe Z sing, translation). The courses devid written interpreta	2 ecific syntactic  2 The RP1 - RP3 elop and expandation). Students
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04XRP1 The entrance requireme structures, understandin 04XRP2 The course is based on structures). Stress is pu 04XRP3 The course is based on courses require good pi these skills. Further studevelop their subtechnical topics.	In the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, pring the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2  RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to no independent oral and written communication.  Russian for Advanced Students P3  RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra revious knowledge of general language at secondary level (listening, reading, correct communication in everyday situations), by is aimed at professional and technical skills (reading technical literature according to the students' specialization, oral and call vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write Russian for Beginners Z1	Z verb aspects, spe Z sing, translation). The courses devid written interpreta	2 ecific syntactic  2 The RP1 - RP3 elop and expand ation). Students th confidence on
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04XRP1 The entrance requirement structures, understanding 04XRP2 The course is based on structures). Stress is pure 04XRP3 The course is based on courses require good puthese skills. Further studevelop their subtechnical topics. 04XRZ1 The course represents the Russian alphabet (for a short text with marked 04XRZ2 The second semester of able to communicate us master further grammat 04XRZ3 The course is based on and listening) and introdunderstood, and to expending the communication on more forms, look up the inform 04XRZ5 The course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific products of the course expects the information from a specific product of the course expects the information from a specific products of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the information from a specific product of the course expects the	Int for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, prig the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2 RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to nindependent oral and written communication.  Russian for Advanced Students P3 RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra revious knowledge of general language at secondary level (listening, reading, correct communication in everyday situations), by is aimed at professional and technical skills (reading technical literature according to the students' specialization, oral and each vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write restricted to the five-semester programme, its final aim being reading and understanding professional texts written in Rus for both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaks) stress, understand its contents and summarize it.  Russian for Beginners Z2  If the programme is designed to teach skills for basic communication in everyday situations and for reading easy and short string short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will ical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.  Russian for Beginners Z3  R22 and includes further everyday topics, develops understanding of short compact texts on new subtechnical topics (for traituces new grammar. Students will be trained to distinguish intonation patterns while listening to spoken language. They will be steheir opinion. Writing skills will be trained to general language in all four skills (reading and understanding longer texts w	Z sing, translation). The courses development of the course several accurately and with the course several accurately and the course several accurate s	2 The RP1 - RP3 elop and expand ation). Students th confidence on  2 Students will be r vocabulary and  2 Students will be r vocabulary and  2 s of reading skills as as to be  2 age of unfamiliar verb patterns and written how to fill in  2 and summarizing lls are trained on
04XRP1 The entrance requirement structures, understanding 04XRP2 The course is based on structures). Stress is pure 04XRP3 The course is based on courses require good puthese skills. Further studevelop their subtechnical topics. 04XRZ1 The course represents the Russian alphabet (for a short text with marked 04XRZ2 The second semester of able to communicate us master further grammat 04XRZ3 The course is based on and listening) and introdunderstood, and to expending the communication on more forms, look up the inform 04XRZ5 The course expects the information from a spece everyday topics. Studying the structures is to the information from a spece everyday topics. Studying the structures is to the information from a spece everyday topics. Studying the structures is the structure of	Int for the course is to achieve the B1 CEFR level. The objective of the course is revision of standard language structures, prig the fundamentals of technical language and training writing skills.  Russian for Advanced Students P2 RP1. It expands grammatical structures important for understanding technical texts (verbal adjectives, participles, passives, to nindependent oral and written communication.  Russian for Advanced Students P3 RP2 and is mainly focused on working with technical and scientific texts (reading comprehension, oral and written paraphra evious knowledge of general language at secondary level (listening, reading, correct communication in everyday situations); by is aimed at professional and technical skills (reading technical literature according to the students' specialization, oral and call vocabulary and practice quick and correct communication in professional situations. They will be able to both speak write  Russian for Beginners Z1  The first stage of the five-semester programme, its final aim being reading and understanding professional texts written in Ruser both reading and writing skills) and fundamentals of grammar necessary for everyday communication (listening and speaks stress, understand its contents and summarize it.  Russian for Beginners Z2  The programme is designed to teach skills for basic communication in everyday situations and for reading easy and short string short sentences and appropriate structures, and read aloud with confidence a short text without marked stress. They will ical structures. They will have mastered with confidence the Russian alphabet and will be able to use it in writing.  Russian for Beginners Z3  Russian for Beginners Z4  Russian for Beginners Z5  students are trained to use grammar structures effectively (e.g., irregular veruperatives, cond	Z sing, translation). The courses development of the course several accurately and with the course several accurately and the course several accurate s	2 The RP1 - RP3 elop and expand ation). Students th confidence on  2 Students will be r vocabulary and  2 Students will be r vocabulary and  2 s of reading skills as as to be  2 age of unfamiliar verb patterns and written how to fill in  2 and summarizing lls are trained on

04XSM1 Spanish for Intermediate Students M1 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., perifrasis 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 Spanish for Intermediate Students M3 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 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 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. 2 04XSP2 Spanish for Advanced Students P2 Ζ 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 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 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. Spanish for Beginners Students Z2 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 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. 2 04XS74 Spanish for Beginners Z4 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 7 2 The course books are supplemented with additional subtechnical materials, so the students will be gradually acquainted with peculiarities of Spanish for specific purposes. In its final part, the general Spanish course based on the course book will end with presentations and, finally, a written and oral examination.

## List of courses of this pass:

Code	Name of the course	Completion	Credits
00EKOT	Economy in Technology	Z	1
	The course introduces the basics of micro- and macroeconomics.	'	ı
00ETV	Ethics of Science and Technology	Z	1
00MAM1	Essentials of High School Course 1	Z	1
00MAM2	Essentials of High School Math Course 2	Z	1
	Review of basics of high school mathematics.	'	ı
00PT	Preparatory Week	Z	2
00RET	Rhetoric	Z	1
The course is focu	sed on the acquisition of speech and voice techniques and on the rules of correct pronounciation. The course is also devoted to the	composition of pub	olic 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 ar	integral part of the	e course.
00UPRA	Introduction to Law	Z	1
00UPSY	Introduction to Psychology	Z	1
01ANB3	Calculus B 3	Z,ZK	8
1. Functional sec	uences and series - convergence range, criteria of uniform convergence, continuity, limit, differentiation and integration of functional	series, power serie	s. Series

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 f	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, spoj derivace integrálu podle parametru. [8] Integrály po k ivkách a plochách. Integrální v ty.	itost a
01FKO	Functions of Complex Variable Z,ZK	3
	rom outlining the Jordan curve theorem and the Riemann-Stieltjes integral. Then basic results of complex analysis in one variable are explained in detail: the details the det	I
•	ion and the Cauchy-Riemann equations, holomorphic and analytic functions, the index of a point with respect to a closed curve, Cauchy's integral theorem, N	I
tneorem, roots of a	holomorphic function, analytic continuation, isolated singularities, the maximum modulus principle, Liouville's theorem, the Cauchy estimates, Laurent series, theorem.	residue
01LAL	Linear Algebra 1 Z	2
	2. Linear dependence and independence. 3. Basis and dimension. 4. Subspaces of vector spaces. 5. Linear mappings. 6. Matrices of linear mappings. 7. Fro	
	theorem.	
01LAL2	Linear Algebra 2 Z,ZK	4
	se matrix and operator. 2. Permutation and determinant. 3. Spectral theory (eigenvalue, eigenvector, diagonalization). 4. Hermitian and quadratic forms. 5. S gonality. 6. Metric geometry. 7. Riesz theorem and adjoint operator. Outline of the exercises: 1. Methods for calculation of inverse matrices. 2. Methods of cal	I
	. 3. Calculation of eigenvalues and eigenvectors. 4. Hermitian and quadratic forms. Canonical form. 5. Scalar product and orthogonality. Calculation of orthog	
	complements. 6. Geometry – exercises and examples. 7. Adjoint operators.	
01LALZ	Linear Algebra 1, exam ZK	2
01MAN	Calculus 1 Z	4
	Basic calculus (real analysis, functions of one real variable, differential calculus).	
01MAN2	Calculus 2  differential calculus: Taylor's Polynomials Taylor's formula 3. Infinite parious criteria of convergence, encretions on parious checkute and conditional convergence.	8
	differential calculus: Taylor's Polynomials, Taylor's formula 2. Infinite series: criteria of convergence, operations on series, absolute and conditional converg power series, the Cauchy-Hadamard theorem, expansion of function into power series, summation of infinite series. 4. Theory of integrals: primitives, definite	
	(Riemann definition), techniques of integration and application of integrals, Generalized Riemann integral	
01MANZ	Calculus 1, exam ZK	4
01PRST	Probability and Statistics Z,ZK	4
	e of probability theory and mathematical statistics. The probability theory is build gradually beginning with the classical definition and continuing till the Kolm	- 1
	ions as random variable, distribution function of random variable and characteristics of random variable are treated and basic limit theorems are stated and le basis of this theory the basic methods of mathematical statistics such as estimation of distribution parameters and hypothesis testing are explained.	proved.
01RMAF	Equations of Mathematical Physics Z,ZK	7
	course is solving integral equations, theory of generalized functions, classification of partial differential equations, theory of integral transformations, and so	lution of
	partial differential equations (boundary value problem for eliptic PDE, mixed boundary problem for eliptic PDE).	
02BPQT1	Bachelor Thesis 1 Z	5
Bachelor's thesis of	on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Sup and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.	ervision
02BPQT2	Bachelor Thesis 2	10
	on the selected topic under the supervision of a selected supervisor, based on the assignment approved by the guarantor, department head and the dean. Sup	ervision
	and regular checking of the project under preparation by the supervisor is performed by means of personal consultations.	
02DEF1	History of Physics 1 Z	2
	ace in the system of sciences. The relationship of man and nature. Natural sciences in ancient Orientand Greece, Greek natural philosophers, Aristotle. Phy. Archimed. Arabic science, European science in Middle Ages. Renaissance - da Vinci, Giordano Bruno. Copernicus, Kepler, Galileo, Huygens. The birth of p	
rioieriiolio perioa,	as experimental science. Newton and his work.	, 0.00
02DEF2	History of Physics 2 Z	2
	of classical mechanics after Newton, Bernoulli's, Euler, Lagrange. Historical development of optics, corpuscular and wave approach. Electricity and magnetis	
-	vanism, electrodynamics and electromagnetism, Faraday and Maxwell. Thermodynamics and its laws, statistical physics, Boltzmann. The birth of modern quebysics, Planck and Einstein. Discovery of radioaktivity, structure of atom, atomic nucleus, Rutherford and Bohr. The way to nuclear energy, Elementary part	
and relativistic p	standard model. The concept of Nature and Universe of today.	10103,
02DPD1	Detectors and Principles of Detection 1 ZK	2
Abstract: The lectu	ures 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 possi	ble and
000000	in which situations they may be dominant. Some applications to Medicine and to study the fundamental structure of matter are presented.	
02DPD2 Abstract: The le	Detectors and Principles of Detection 2 ZK   ectures introduce the main ideas needed to understand how detector systems work. It will be focused on gaseous detecting principles, scintilating principles	4 and
Aboutdot. The le	semiconductor detecting principles. Basic information about various detector constructions is provided.	, una
02ELMA	Electricity and Magnetism Z,ZK	6
•	oulomb's law, electrostatic field, Gauss' law. Electric dipole, polarization. Conductors and dielectrics. Electric current and circuits, conductivity. Basics of the r	elativity
·	y. Electrodynamic forces,magnetic field. Magnetic dipole, magnetics. Electromagnetic induction, ac currents. Electromagnetic waves,Maxwell equations	
02EXF The goal of this sub	Experimental Physics   ZK   bject is to introduce the students the principles of physics measurements, their techniques, methods and instruments that are used for such measurements,	2 and the
The goal of time out	analysis of measured data.	
02FYS1	Physical Seminar 1 Z	2
	devoted to detailed study of interesting physical problems. It should help students to deeper understanding of fundamentals of physics presented in the cou	rse of
	anics. The problems are chosen, studied and presented by the students themselves, with the possibility to use PC and physical laboratory equipments.	
02KM1 Abstract: The lectur	Quantum Mechanics 1 Z,ZK   re 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.	6 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
	cture expands the introduction to quantum mechanics with more general formalism of quantum theory, approximate methods and path integral. It summarizes	
terminology and me	ethods used in various applications of quantum mechanics and prepares the students for an effective scientific research and further study, in particular, of the formulations of quantum field theory.	modern
02KPRA2	Quantum Laboratory 2 KZ	4
	nents designed to master the operation of devices used in physics and technology dealing with experiments at the quantum level. Experiments are chosen s	
	the student will become accostumed with demanding parts of experimental physics and demonstrate quantum effects.	

		Z	4
	cs, physical quantities and units. Particle kinematics, basic types of motion and theirsuperposition. Particle dynamics, one-dimensio	nal equations of m	notion, mo
	eld, forces innoninertial reference frames. Mechanics of system of free particles, two-body problem, collisions. Mechanics ofrigid bo	•	
02MECHZ	continuum mechanics, elasticity, hydrodynamics. Sound.	•	
OZIVIZOTIZ	Mechanics - Examination	ZK	2
	The content of the subject is the examination according to the plan of studies.	211	_
00NIOAD4		7	
02NSAD1	Simulations and Data Analysis Tools 1	Z	2
1	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 review	ed.	
02PRA1	Experimental Laboratory 1	KZ	6
ecture is intended	especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear E	ı Engineering). But i	t can be a
	s interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with the		
-	t (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluate	•	-
	practically extendthe knowledge gained in lectures on physics.		
02PRA2	Experimental Laboratory 2	KZ	6
	· · · · · · · · · · · · · · · · · · ·	I	_
	especially for students who intend to study some of the physical specializations of FNSPE(branch Physical Engineering, Nuclear E		
	s interested in the otherspecializations. In Experimental laboratory students learn how to prepare for experiments (including work with the		
the measurement	t (acquire of different experimental procedures and routines), willteach writing the records of measurement, processing and evaluate	tion of results. At the	he same t
	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
-	roduction to analytical mechanics. The students acquire knowledge of the basic concepts of the Lagrange and Hamiltonian formalism		
	ynamics (Newton's, Lagrange, Hamilton and Hamilton-Jacobi equations). The efficiency of these methods is illustrated on elementa		
	on of a system of constrained mass points, and of a rigid body. Advanced parts of the course cover differential and integral principle		
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	the first part of the course of classical theoretical physics (02TEF1, 02TEF2).	o or meditallide. H	io subjet
207550		7.71	
02TEF2	Theoretical Physics 2	Z,ZK	4
Tensors and trans	sformations in physics. Mechanics of point mass, rigid body and continuum. The special theory of relativity: relativistic mechanics ar	nd classical field th	neory in th
inkowski space-tin	ne. Classical electrodynamics: Maxwell's equations in the Minkowski space-time, electromagnetic waves in dielectric media, electro	magnetic radiation	n in the di
	approximation.		
02TER	Heat and Molecular Physics	Z,ZK	4
	of materials, heat transfer; stationary and non-stationary heat conduction, heat transfer and penetration; 1st and 2nd thermodynam		and real
	cal systems: dielectric and magnetic materials; Maxwell relations and thermodynamic potentials; kinetic theory: Maxwell's velocity dis		
			Illoii lileoi
02TSFA	Thermodynamics and Statistical Physics	Z,ZK	4
oundation of therm	odynamics and statistical physics. Thermodynamic potential, the Joule Thomson effect, conditions of equilibrium, the Braun-Le Chate	elier principle. Stati	stical entr
asics of many bod	ly descriptionfrom a statistical point of view (classical and quasiclassical regime within the frame of a canonical and grand-canonica		
•		al ensemble, Ferm	
	of crystals and the black body radiation). The Boltzmann equation is used to discusses simple transport phenomena.	al ensemble, Ferm	
-			i gas, mo
02UFEC	Introduction to Elementary Particle Physics	Z	i gas, mo
02UFEC The course	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s	Z subject are presen	i gas, mo
02UFEC	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s Introduction to Quantum Theory	Z	i gas, mo
02UFEC The course 02UKT	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory  The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.	Z subject are presen	i gas, model ted.
02UFEC The course 02UKT 02VOAF	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory  The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.  Waves, Optics and Atomic Physics	Z Subject are presen Z	i gas, mo
02UFEC The course 02UKT 02VOAF	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory  The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.	Z Subject are presen Z	i gas, model ted. 2
02UFEC The course 02UKT  02VOAF Wave phenomena	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory  The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.  Waves, Optics and Atomic Physics	Z subject are presen Z Z,ZK ation, interference	i gas, mo
02UFEC The course 02UKT  02VOAF Nave phenomena	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.  Waves, Optics and Atomic Physics in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polarize	Z subject are presen Z Z,ZK ation, interference	i gas, mo
02UFEC The course 02UKT  02VOAF Nave phenomena coherence. Geon	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.  Waves, Optics and Atomic Physics in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polariz netrical optics. Introduction toquantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Brequation, stationary states and spectra of finite systems.	Z subject are presen Z Z,ZK ation, interference oglie waves,the Se	i gas, mo
02UFEC The course 02UKT  02VOAF Wave phenomena coherence. Geon	Introduction to Elementary Particle Physics e provides an easily accessible introduction to elementary particle physics. Development, methods, goals and perspectives of the s  Introduction to Quantum Theory The aim of the lecture is to introduce the basic principles of quantum theory and its interpretation on simple examples.  Waves, Optics and Atomic Physics in mechanics and electromagnetism: modes, standing and travelling waves, wave packets indispersive media. Wave optics: polariz netrical optics. Introduction toquantum physics: black body radiation, quantum of energy, photoeffect, the Compton effect, the de Brequation, stationary states and spectra of finite systems.  Foundations of Physical Measurements 1	Z subject are presen Z Z,ZK ation, interference oglie waves,the So	i gas, mo 2 tted. 2 6 a, diffractio
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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 7K 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 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 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 Ζ 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** The course content is the examination as given by the study plan. The student is supposed to demonstrate mastering the AP3 syllabus and the ability to apply their knowledge obtained in the three AP courses. The examination consists of 2 parts - written (110 min) and oral (30 min) and includes also oral presentation of a topic from the student's field of study. 04XCESM1 Czech for Foreigners - Intermediate 1 7 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 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. 7 2 04XCESM3 Czech for Foreigners - Intermediate 3 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. Czech for Foreign Students - Advanced 1 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 Ζ 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 Ζ 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 7K 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 Ζ 2 The course is designed for students on the English programme. Students will become acquainted with the main characteristics of Czech (phonetic and grammar features) and they will acquire basic language and speaking skills. The course focuses on pronounciation exercises, simple social phrases, and oral and written communication in the most common communicative situations. The course covers roughly lessons 1-5 in "Chcete mluvit esky" by H. Remediosová and E. echová. At the end of the course, the students will have reached A1 (CEFR) approximately. Czech for Foreigners - Beginners 2 The language and communication competences acquired in CESZ1 are further developed. Students extend their knowledge of Czech declension and conjugation system and practise communication of frequent topics. The course covers roughly lessons 6-10 in "Chcete mluvit esky" by H. Remediosová and E. echová. At the end of the course, the students will have reached A2 (CEFR) approximately. 04XCESZ3 Czech for Foreigners - Beginners 3 The course further develops the language and communication competences acquired in the XCESZ1 and XCESZ2 courses. The teaching focuses on building up basic vocabulary, correct pronunciation, deepening grammar, including grammar practice, and introducing Czech culture. Students are asked to produce simple texts and they practise frequent types of dialogue. They also practise understanding texts in terms of main ideas or looking for specific details in texts. The course covers roughly lessons 5-7 in " eština expres 1". 04XCESZZK Czech for Foreigners – Beginners - Examination 7K 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 7 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, requesto an advert, French culture and geography, Paris. Topics of specialization: mathematics, physics. Reading technical and popular science texts, work based on these	
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	
and scientific language (passives, nominalization, word formation). Topics: physics, power engineering, environment, Internet, success of French science and technology 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 infiniti participle structures, compound tenses). Text summaryStudents prepare a written paper which will be delivered in form of an oral presentation in-class. The paper is link	
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 Frei	
and one's own knowledge/experienceLonger 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 covering the contents of FM1-FM3. The examination covering the contents of FM1-FM3.	amination
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   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. St	2 udents 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 infor	
to solve problems. FP1 The course builds on and further develops linguistic competence acquired at secondary school. Difficult grammar topics are repeated and expanded	
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: ma	athematics,
internet, physics, chemistry. Reading of technical and popular science texts, further work with these texts and interpretation.	
04XFP2 French for Advanced Students P2 Z 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. Feature	2 es typical of
technical and scientific communication are stressed (passive voice, nominalization, word formation).	s typicai oi
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.	
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	ed 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 ac Examination Instructions, a document available on the web. Assessment of the presentation is included into the examination grading.	cording to
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 profe	
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 e	lementary
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 beg	_
(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,	_
giving the directions, simple instructions and questions. Special attention is paid to pronunciation. Spelling is explained in connection with pronunciation and gramm 04XFZ2 French for Beginners Z2 Z	1ar. 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 -	
French for Beginners . Additional topics and skills are filled in from the textbook Espaces I, lesson 1 - 5 (introductions, invitation, welcoming, agreement - disagreement,	
thanking, travelling, map of France, food, expression of will, wish, order, prohibition, pleasure). Correct pronunciation is practiced. Stress on oral communication. Specific topic	cs 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 E 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 a	-
pronunciation practice. Reading covers short adapted texts of general interest first, and later popular science texts.	ao part or
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 contents are further developed.	vered 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 E	
Students of FJFI. The course covers generals and specific topics: health- illness, sport, free time, environment, study, travelling in France, Paris, shopping, weather, universecountry and in France, how to write CV, application, topics in mathematics, reading physics - mechanics, informatics, internet.	rsity in our
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	
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 fro	
notes, success of French science and technology, information about France. Grammar is systemized and complemented with syntax (subordinate clauses, typical conju	nctions,
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 Instruction for examination. Its content covers the levels FZ1 - FZ5.	aocument
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 page 1) and the course is to level off the students' skills in the German language.	
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 fundamental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamental issues together with all necessary expressions and phrases, expressions and phrases needed to chemists, mathematicians, physicists, and the fundamental issues together with all necessary expressions and phrases.	itals 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  The course introduces other more complex grammatical structures and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in communication based on technical texts, such as the relation between technology and their application in the relation between technology and their application in the relation between technology and their application in their application in the relation between technology and their application in the relation between technology and their application in the relation between texts.	2 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 g	
phenomena important for professional discourse (participles, relative clauses).	rammatical
phenomena important for professional discourse (participles, relative clauses).  04XNM3 German for Intermediate Students M3 Z	rammatical 2
phenomena important for professional discourse (participles, relative clauses).	rammatical  2 and society,

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 7K 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 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 7 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 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 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. Russian for Intermediate Students M1 04XRM1 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 Ζ 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 2 Russian for Intermediate Students M3 Z 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 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 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. Russian for Advanced Students P2 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 7 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 7K 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 Russian for Beginners Z1 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 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 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 Ζ 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.

information from a everyday topics.	Russian for Beginners Z5		
information from a everyday topics.		Z	2
everyday topics.	is the student to have completed RZ4. It concentrates predominantly on reading skills (working with professional texts, i.e. understandin	-	- 1
	specialized text) and speaking, and to a certain extent, writing about the professional information obtained by reading the texts. Comm		
pass	Studying grammar is based on professional and technical texts and only includes items typically used in professional communication (		participles,
	ve voice). Students develop their technical and economic vocabulary, and are also trained in some professional skills (writing a CV, pc	lite request, etc.)	
04XRZZK	Russian for Beginners Examination	ZK	3
	nt is the examination as given by the study plan. The course is completed by taking a written and oral examination testing the knowled		
- RZ5. Stu	dents are eligible for the oral examination only after a prior pass in RZ5 and a successful written examination. Students are given instr	uctions by the teac	her.
04XSM1	Spanish for Intermediate Students M1	Z	2
The course is de	signed for students whose competence is at level B1 of CEFR, i.e. those who studied Spanish in the secondary school. The 3-semest	er course develops	standard
vocabulary and p	ays attention to further grammar topics (e.g., perifrasis verbales, futuro imperfecto, direct object and indirect object pronouns, negativ	e form of the imper	rative, and
subjunctive	e), to written and oral communication on a given everyday or easy subtechnical topic, for which the students are trained by reading tex	ts or listening to th	em.
04XSM2	Spanish for Intermediate Students M3	Z	2
The course deve	ops the students' knowledge from the previous course (SM1). Students are gradually acquainted with fundamentals of Spanish for sp	ecific purposes in o	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 academi	c 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 shor	t articles and sumr	maries. The
	final part of the programme, general Spanish course based on course books, covers presentations and, finally, a written and oral ex-	amination.	
04XSMZK	Spanish for Intermediate Students Examination	ZK	4
The course conter	t is the examination as given by the study plan. SMZK examination consists of two parts - written and oral; to be eligible for the written parts.	art, students will ha	ve obtained
	non-graded assessment for course SM3.Oral examination follows the written part.		
04XSP1	Spanish for Advanced Students P1	Z	2
	tes on more difficult grammar topics, revision of vocabulary, basics of Spanish for specific purposes as well as written communication.	Course prerequisit	es: level B2
	of CEFR.		
04XSP2	Spanish for Advanced Students P2	Z	2
	e second part of the advanced Spanish course, extending Spanish for specific purposes topics. It comprises more grammar and syntax	_	
	written communication.		
04XSP3	Spanish for Advanced Students P3	Z	2
	final part of the advanced Spanish course. It is based on texts chosen by the students according to their future specialization. It is focu		
	based on what students will need in their career.	iood on written con	illiariioation
04XSPZK	Spanish for Advanced Students Examination	ZK	
	t is the examination as given by the study plan. Examination SPZK consists of two parts, namely oral and written. The prerequisite for a		
The course conten	passed the written test. Examination content is based on syllabi of courses SP1, SP2, and SP3 or on an individual study plan of the		art is riavirig
04XSZ1		7	2
	Spanish for Beginners Z1	_	_
	first stage of the five-semester programme of Spanish studies; during the first stage the students will master phonetics and fundament communicate at an elementary level on topics of everyday life. They will acquire and extend fundamental vocabulary of general Span	-	
04XSZ2			2
	Spanish for Beginners Students Z2 ed on course SZ1, and expects students to develop and extend the knowledge and skills acquired so far. Grammar structures and lexis	Z	
	ed on course SZ1. and expects students to develop and extend the knowledge and skills acquired so far. Grammar structures and lexis		
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	d short adapted written texts and speech. Attention is also paid to cultural differences between Spanish-speaking countries and other		as to enable
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11ZFPL			
	Basic to Solid State Physics	KZ	2
	amental properties of solids following the regular long distance ordering of atoms in a crystal lattice. Based on the introduced bonding s of crystals and their properties are defined. The model of crystalline lattice dynamics in harmonic approximation is described and basic		
	periodic potential of the crystal lattice is introduced and its relation to the following model describing the energetic state of electrons in		-
energy bands ex	plained. The special consequences of band approach to the physical properties of solids are elucidated. The aim of the course is to s	ystematically intro	duce and
	interpret a broad phenomenological basis of physical properties of crystalline solids		
12KOE	Fundamentals of Classical Optics and Electrodynamics	ZK	4
	ed on the basics of classical optics and electrodynamics, which is important especially in relation to quantum optical theory. The lectu optics, material aspects of optical phenomena, introduction to geometrical optics, and fundamentals of nonlinear optics, including disp		- 1
	e in optical media, including anisotropic ones. Attention is also given to beam optics. Further, it focuses on the implications of statistics		
	ction theory and holography. It explains the relation between wave optics and ray optics, describes light propagation in term of rays, a		
of instrumental o	otics. It also includes the basics of guided waves and resonators - the theory of guided waves in waveguides and optical fibers, waveg dispersion, reciprocity theorem and optical resonator theory.	guide modes and v	vaveguide
12LAS	Laser Systems	Z,ZK	3
	nanosecond lasers. Picosecond lasers. High energy laser systems. Laser fusion. Diode-pumped solid state lasers. Tunable lasers. O	•	
and raman lasers	Semiconductor lasers for pumping of solid state lasers and diode pumped solid state lasers Amplified spontaneous emission. Ultravio	=	asers. High
401405	power continuous lasers. Infrared high power lasers. Submillimeter lasers. Lasers with high degree of coherence. Free electron la		
12MOF Basic	Molecular Physics   deas on multi-atomic molecules and molecular matter, and on structure-to-physical properties relations. Methods of molecular structu	ZK ure determination	2
12NME1	Numerical Methods 1	Z,ZK	4
	the basic principles of numerical mathematics important for numerical solving of problems important for physics and technology. Met	,	-
important for phys	cists (ordinary differential equations, random numbers) are included in addition to the basic numerical methods. Integrated computati	onal environment	MATLAB is
40DV/TI	used as a principle programming language as a demonstration tool. The seminars are held in computer laboratory.	7	
12PYTH	Scientific Programming in Python rse is to learn the fundamentals of the modern Python programming language with a focus on scientific computing. Emphasis is place	Z d on effective solu	2 tions to real
	burse is performed in an interactive form of practical exercises, whose topics can be tailored to the content of other subjects or studer		
involved in ongoi	g research. In the introductory part of the course, students learn the basic features of Python?from basic types to object oriented or f	functional program	ming. The
greater part of th	e course focuses on specific features of Python for scientific programming. Presented are the main numerical libraries NumPy, SciPy	and the Matplotlib	graphics
12UFN	library. We show how to generate efficient code, how to combine Python with other languages, what tools are available.  Introduction to Photonics and Nanostructures	KZ	3
_	ructures and nanotechnologies; quantum technologies; quantum nanostructures; photonic structures; nanophotonics and nanoplasm		
	fibers; integrated photonics; computer simulations; technological realization; student presentations	, . ,	
12ULAT	Introduction to Laser Technique	KZ	2
Overview of electronic	omagnetic radiation sources; laser principle; classification of lasers; characterization and rough application of various types of lasers;	laser safety preca	utions. The
12UMF	laser amplifier, Q-switching, mode-locking.	7	3
_	Introduction to Modern Physics  ded to be a concise introduction to modern / nonclassical physics for students who have already had basic classical physics course. A	_	_
	in a computational laboratory.	,	
12UNXAP	Introduction to UNIX	Z	2
	perating systems. Personal computer, workstation and supercomputers. Processor, memory, bus, devices, hard disk, network interfaction and supercomputers. Processor, memory, bus, devices, hard disk, network interfactions.		
	ing systems. Operating system UNIX. Basic principles, kernel, kernel services. Documentation. File system, file atributes, working wit eter (shell) bash and its programming (scripts). Controlling processes, process status, computer load a process priorities. Standard to		
-	puter networks. Local computer networks. Global computer networks. Addresses and protocols TCP/IP. Network configutation of a co		
	hardware sharing, mail, scp, etc. Network applications		
12UVP	Introduction to Scientific Computing	Z	2
Practically oriente	d Introduction to scientific computing. Constituent part of the course is realized in computer classroom. Students get acquinted with so	ome pasic tools to	
	and technicyal computing, data analysis, data visualisation and algorithm development		T SOICH IIIIO
12VKT	and technicval computing, data analysis, data visualisation and algorithm development.  Vacuum Technology		4
12VKT Rarefied gasses:	and technicval computing, data analysis, data visualisation and algorithm development.  Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surface.	KZ	4
Rarefied gasses: transport through s	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfar proposes, Ultimative pressure, Pumping speedPumps and their pro	KZ ce; sorption, desor perties:-Positive di	4 ption; gas splacement
Rarefied gasses: transport through s pumps: Diaphrag	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surface oblid matter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their prom, Sliding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorption	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin	4 ption; gas splacement nation and
Rarefied gasses: transport through s pumps: Diaphrag	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfar proposes, Ultimative pressure, Pumping speedPumps and their pro	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin	4 ption; gas splacement nation and
Rarefied gasses: transport through s pumps: Diaphrag	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfact polid matter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their promotes, Sorption pumps: Cryopumps, Cryo-Adsorptic etter pumps. Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Mater	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin	4 ption; gas splacement nation and
Rarefied gasses: transport through s pumps: Diaphrag NEG pumps, Ion g	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfact plid matter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their promation, Sliding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorptietter pumps Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Mater and seals. Practical exercises.  Scientific and Technical Computing familiar with methods of solving of computational problems in the scientific and technical practice, and with methods of their programs.	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin ials and vacuum c	4 ption; gas splacement nation and omponents
Rarefied gasses: transport through s pumps: Diaphrag NEG pumps, lon of 12VTV The students get	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfact plid matter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their promount, Sliding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorptice etter pumps Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Mater and seals. Practical exercises.  Scientific and Technical Computing familiar with methods of solving of computational problems in the scientific and technical practice, and with methods of their programmainly to programming in the Fortran language.	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin ials and vacuum c  Z ming. The course i	4 ption; gas splacement nation and omponents  2 s oriented
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Rarefied gasses: transport through s pumps: Diaphrag NEG pumps, lon g 12VTV The students get 12ZEL1 The subject provi	Vacuum Technology basic concepts and relations; diffusion,flow of rarefied gases. Flow and current of gas, conductivity. Interaction of gas with solid surfact plid matter; evaporation, condensation; Vacuum generation: Pumping proces, Ultimative pressure, Pumping speedPumps and their promous, Siding vane rotary, Diffusion, Molecular, Roots, Molecular and Turbomolecular pumps. Sorption pumps: Cryopumps, Cryo-Adsorption etter pumps. Vacuum measurements: vacuum gauges of total and partial pressure; pumping speed; gas flow, search for leaks. Materiand seals. Practical exercises.  Scientific and Technical Computing familiar with methods of solving of computational problems in the scientific and technical practice, and with methods of their programmanly to programming in the Fortran language.  Basic Electronics 1  des primary knowledge of circuit theory concerning principles of electronic circuits in both stationary and harmonic stable state. Circuits	KZ ce; sorption, desor perties:-Positive di tion pumps, Sublin ials and vacuum c  Z ming. The course i  Z,ZK it analysis method	4 ption; gas splacement nation and omponents  2 s oriented  3 s for linear
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14TED	Creating Electronic Documents	Z	2
Basic skills for creat	ing and presenting student theses. Individual exercises focus on creating and formatting texts, equations, charts, tables, presentatio	ns and entire docu	ments in an
	office suite.		
17UING	Introduction to Engineering	KZ	3
This course provide	es introduction to engineering skills. Students should gain general engineering skills at basic level (e.g. material properties and beha	avior, basics of ma	nufacturing
an	d production, quality assurance, environmental impacts,). In addition, the introduction to scientific work and technical drawing will	be included.	
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 co	urse covers the object oriented programming and othesr advanced constructs in the C+;+ programming language and the Standard	Template Library.	1
18ZPRO	Basics of Programming	Z	4
This course is in	tended mainly for students with little or no experience in programming. It familiarizes the students with the basic concepts in program	nming and with the	Python
	programming language.		
TV-1	Physical Education	Z	1
TV-2	Physical Education	Z	1
TV-3	Physical education	Z	1
TV-4	Physical education	Z	1

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