Study plan

Name of study plan: 09 116 NSTI VMI 2012 základ

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Welcome page
Type of study: unknown
Required credits: 121
Elective courses credits: 0
Sum of credits in the plan: 121
Note on the plan:

Name of the block: Compulsory courses in the program
Minimal number of credits of the block: 84
The role of the block: P

Code of the group: 12NS*1P-VMI
Name of the group: 2012 NSTI 1.sem povinné VMI
Requirement credits in the group: In this group you have to gain 26 credits
Requirement courses in the group: In this group you have to complete 6 courses
Credits in the group: 26
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
2321071	**Physical metallurgy** *Lucie Pilsová, Jiří Janovec, Jan Krčil, Jana Sobotová **Jan Krčil** Jana Sobotová (Gar.)*	Z,ZK	5	3P+1C	*	P
2321075	**Integrity of materials** *Lucie Pilsová, Jiří Janovec, Pavlína Hájková, Jakub Horváth, Tomáš Vampola **Jakub Horváth** Jakub Horváth (Gar.)*	Z,ZK	4	2P+1C	*	P
2331090	**Theory of Casting** *Bohumír Bednář, Barbora Bryksí Stunová, Aleš Herman, Irena Kubelková, Milan Němec, Jindřich Zeman, Zdeněk Kopanica **Aleš Herman** Aleš Herman (Gar.)*	Z,ZK	5	3P+1C	*	P

Characteristics of the courses of this group of Study Plan: Code=12NS*1P-VMI Name=2012 NSTI 1.sem povinné VMI

2321071	Physical metallurgy	Z,ZK	5
The course deals with the explanation of processes and procedures which form the the theoretical fundamentals of engineering and mechanical engineering technologies. Emphasis is laid on thermodynamics, diffusion, crystal lattice structures and their imperfections, phase transformations and hardening and dehardening processes. Attention is also paid to degradation processes, i.e. failure of materials, fatigue, creep, corrosion, wear and radiation failures.			
2321075	Integrity of materials	Z,ZK	4
Dealing with tasks of continuum mechanics; finite element method. Matrix and tensor calculus of stress and strain. Linear and nonlinear fracture mechanics. Assessment of conditions of integrity of structures, operation, safety and reliability of structures with defects.			
2331090	Theory of Casting	Z,ZK	5
Properties of liquid alloys. Crystallization of foundry alloys. Volume changes during cooling and solidification, and their consequences. Principles of Feeding. Controlled solidification. Interaction the metal with the mold. Defects resulting from shrinkage. Cast iron with lamellar graphite. Cast iron with spheroidal graphite. Malleable cast iron. Cast iron with vermicular graphite. Iron for special use. Metallurgy of steel. Metallurgy of aluminum alloys, magnesium and titanium. Alloys of copper.			

Code of the group: 12NS*2P-VMI
Name of the group: 2012 NSTI 2.sem povinné VMI
Requirement credits in the group: In this group you have to gain 32 credits
Requirement courses in the group: In this group you have to complete 7 courses
Credits in the group: 32
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
2321072	**Metallic Materials** *Jakub Horník, Elena Čižmárová* ***Jakub Horník*** *Jakub Horník (Gar.)*	Z,ZK	5	2P+2C	*	P
2341082	**Non-convetional material removal processes** ***Pavel Novák***	Z,ZK	4	2P+1C	*	P
2322042	**Advanced materials in engineering** ***Jiří Janovec***	KZ	4	1P+2C	*	P
2341066	**Programming of metal cutting on CNC machines** *Jan Tomíček, Pavel Novák* ***Pavel Novák*** *Jan Tomíček (Gar.)*	Z,ZK	5	2P+3C	*	P
2332114	**Project II** ***František Tatíček***	KZ	5	0P+5C	*	P
2332025	**Special Technologies of Surface Treatments** *Jaroslav Červený, Zdeněk Hazdra, Viktor Kreibich, Jiří Kuchař* ***Jiří Kuchař*** *Viktor Kreibich (Gar.)*	KZ	4	1P+2C	*	P
2331097	**Theory of Joining and Cutting** *Tomáš Gurčík, Ladislav Kolařík, Marie Kolaříková, Antonín Kříž, Pavel Rohan* ***Ladislav Kolařík*** *Ladislav Kolařík (Gar.)*	Z,ZK	5	2P+2C	*	P

Characteristics of the courses of this group of Study Plan: Code=12NS*2P-VMI Name=2012 NSTI 2.sem povinné VMI

2321072	Metallic Materials	Z,ZK	5
Metallic materials. Classification of metallic materials. Low-carbon weldable steels with higher strength. Stainless steels. Austenitic stainless steels, ferritic stainless steels. Heat-resisting and creep-resisting steels. Tool steels. Non-ferrous metal alloys - basic classification. Copper and copper alloys. Aluminium and aluminium alloys. Titanium and titanium alloys. Heat treatment of metallic materials			
2341082	Non-convetional material removal processes	Z,ZK	4
Basic working principles, current machining apllications, future development. Electrodischarge machining - principle, mechanism of material removal, hole and 3 - D schapes production, wire electrodischarge maschining. The utilization of the energy beams for machining - laser, electron and ion beams, plasma arc. Electrochemical machining - basic principle, applications, full - form shaping. Chemical machining. Water - jet and ultrasonic machining. Technological, economical and surface quality consideration when using nonconventional processes.Environmental and Safety Aspacts of Electrophysical and Electrochemical Processes.			
2322042	Advanced materials in engineering	KZ	4
Subject promising materials provide an overview of selected recent construction materials. It is presented the development and the physico-mechanical properties of these materials and listed the most common types of these materials. Demonstrated their fundamental characteristics, including economic considerations and international manufacturers. They presented their technological capabilities, usability and design methods for marking.			
2341066	Programming of metal cutting on CNC machines	Z,ZK	5
Processing mock-up for casting, let us say mock-up of die tool models to the form of NC programme for CNC controlled milling machine. Usage of CAM system. Optimalization of tool paths with reference to cycle time and achieved quality of finished machined surface.			
2332114	Project II	KZ	5
The subject deals with the usage of computer aided techniques in production processes of forming, casting and welding. Basic characteristics of the software FORGE, PAMSTAMP, QForm, Novacast, ProCAST, MagmaSoft and SYSWELD with demonstration of selected examples.			
2332025	Special Technologies of Surface Treatments	KZ	4
Special surface treatment technology , advanced technology trends. Measurement of process parameters in surface technology , computer technology in the management and control of surface treatment . Special surface preparation , combined pretreatment , pretreatment quality control . Conversion layer , in-process protection, anodic oxidation. Testing and quality control of surface treatments. Ways of creating functional coatings , verification of performance . Finishes to heat and abrasion, special skid coatings . Abrasion resistance , tribological properties. Galvanic alloy and composite coatings. Thermally sprayed coatings and their composition. Hot-dip coated in molten metals. Electroforming , the excretion of heavy coatings. Molds for engineering technology methods of surface treatment. Finishes in electrical engineering and electronics. Surface finishing machine tools. Coatings with nanoparticles . Disposal of waste water and environmental issues . Techno-economic indicators finishes.			
2331097	Theory of Joining and Cutting	Z,ZK	5
Course covers technologies of welding, brazing and thermal cutting. Description of joining methods, their principals, equipment and typical application in the industry is done. In focus are welding technologies (SMAW, GMAW, GTAW, SAW), oxyacetylene cutting, plasma cutting. Covered is also topic of material weldability and assessment of joint quality by destructive and non-destructive methods.			

Code of the group: 12NS*3P-VMI
Name of the group: 2012 NSTI 3.sem povinné VMI
Requirement credits in the group: In this group you have to gain 21 credits
Requirement courses in the group: In this group you have to complete 5 courses
Credits in the group: 21
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
2321073	**Non-metallic metals** *Zdeňka Jeníková, Taťana Vacková* ***Taťana Vacková*** *Taťana Vacková (Gar.)*	Z,ZK	4	2P+2C	*	P
2382052	**Business and Management** *Petr Žemlička, Miroslav Žilka* ***Miroslav Žilka*** *Miroslav Žilka (Gar.)*	KZ	3	2P+1C	*	P
2342114	**Project III.** ***Pavel Novák***	KZ	5	0P+5C	*	P
2341004	**Manufacturing systems design** *Jiří Kyncl* ***Pavel Novák*** *Libor Beránek (Gar.)*	Z,ZK	4	2P+2C	*	P

2331012	**Theory and Practise of Metal Forming** *Vít Novák, František Tatíček* ***František Tatíček*** *František Tatíček (Gar.)*	Z,ZK	5	3P+2C	8	P

Characteristics of the courses of this group of Study Plan: Code=12NS*3P-VMI Name=2012 NSTI 3.sem povinné VMI

2321073	Non-metallic metals	Z,ZK	4

The lectures cover the entire range of non-metallic engineering materials, a majority of them are devoted to polymer materials which are most frequently used in mechanical engineering and the volume of their consumption highly exceeds that of the rest of non-metallic materials. Emphasis is laid on explanation and realization of basic terms in the field of non-metallic materials. The lectures also deal with standardization, environmental and economical aspects which follow from the different properties of non-metallic and metallic materials.

2382052	Business and Management	KZ	3

This course introduces entrepreneurship as a way relevant to student's future professional career. Technically oriented students who haven't any specialized economical and management courses in their curriculum are introduced to the fundamental issues needed to start of their own businesses using simple and understandable form. To study the basic information of individual topics e-learning materials accessible on the web portal are prepared. Acquired knowledge is then practiced at workshops involving external lectors. Evaluation and classification is based on the e-learning tests and student?s case study, related to small business issues (mostly the business plan of a start-up company).

2342114	Project III.	KZ	5

Course is focused on solving a complex tasts from the field of machining, process planning and metrology.

2341004	Manufacturing systems design	Z,ZK	4

Theory and methodology of technological designing, time and spatial structures of production systems. The aim of the course is to teach students with modern approaches and methodology of production systems designing with respect to their flexibility, productivity and production quality. Introduct students to the complex design of production systems within the supply chain. Students will be acquainted with modern methods of industrial engineering and lean manufacturing.

2331012	Theory and Practise of Metal Forming	Z,ZK	5

Fundamentals of metal forming theory. Stress-strain relationships in elasticity and plasticity. Methods for analyzing metalworking processes. Workability of metals. Individual constraints in metalforming and their influence on the forming process. Fundamentals of theory and practice of basic bulk metal and sheet metalworking processes. Calculation of energy and loads in forming, selection of forming equipment.

Code of the group: 12NS*4P-VMI
Name of the group: 2012 NSTI 4.sem povinné VMI
Requirement credits in the group: In this group you have to gain 5 credits
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 5
Note on the group:

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 37
The role of the block: PV

Code of the group: 12N**3Q--JV
Name of the group: 2012 N 3.sem povinná jazyková výuka
Requirement credits in the group: In this group you have to gain 2 credits
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 2
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**
2043081	**English - Preparatory Course / FME** *Veronika Kratochvílová, Eliška Vítková, Ilona Šimice, Michaela Schusová, Hana Volejníková* ***Nina Procházková Ayyub***	Z	2	0P+2C	*	PV
2043086	**Czech - Preparatory Course** *Michaela Schusová, Hana Volejníková, Petr Laurich*	Z	2	0P+2C	*	PV
2043083	**French - Preparatory Course / FME** *Michaela Schusová, Dušana Jirovská* ***Michaela Schusová*** *Dušana Jirovská (Gar.)*	Z	2	0P+2C	*	PV
2043082	**German - Lower Intermediate Course** *Eliška Vítková, Michaela Schusová, Petr Laurich, Jaroslava Kommová* ***Jaroslava Kommová*** *Jaroslava Kommová (Gar.)*	Z	2	0P+2C	*	PV
2043085	**Russian - Preparatory Course / FME** *Michaela Schusová, Hana Volejníková, Dušana Jirovská* ***Eliška Vítková***	Z	2	0P+2C	*	PV
2043084	**Spanish - Preparatory Course / FME** *Michaela Schusová, Jaime Andrés Villagómez* ***Eliška Vítková***	Z	2	0P+2C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12N3Q--JV Name=2012 N 3.sem povinná jazyková výuka**

2043081	English - Preparatory Course / FME	Z	2

Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language. European level A1 - A2.

2043086	Czech - Preparatory Course	Z	2

Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.

2043083	French - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2043082	German - Lower Intermediate Course	Z	2
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2043085	Russian - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2043084	Spanish - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			

Code of the group: 12N**3Q--JZ
Name of the group: 2012 N 3.sem povinná jazyková zkouška
Requirement credits in the group: In this group you have to gain 1 credit
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 1
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
2041081	**English - Master Exam** *Veronika Kratochvílová, Eliška Vítková, Ilona Šimice, Michaela Schusová, Hana Volejníková, Michele Le Blanc, Nina Procházková Ayyub* ***Nina Procházková Ayyub*** *Ilona Šimice (Gar.)*	ZK	1	0P+0C	*	PV
2041086	**Czech- Master Exam** *Michaela Schusová, Hana Volejníková, Petr Laurich*	ZK	1	0P+0C	*	PV
2041083	**French - Master Exam / FME** *Michaela Schusová, Dušana Jirovská* ***Dušana Jirovská*** *Dušana Jirovská (Gar.)*	ZK	1	0P+0C	*	PV
2041082	**German - Master Exam / FME** *Eliška Vítková, Michaela Schusová, Petr Laurich, Jaroslava Kommová* ***Jaroslava Kommová*** *Jaroslava Kommová (Gar.)*	ZK	1	0P+0C	*	PV
2041085	**Russian - Master Exam / FME** *Michaela Schusová, Hana Volejníková, Dušana Jirovská* ***Eliška Vítková***	ZK	1	0P+0C	*	PV
2041084	**Spanish - Master Exam / FME** *Michaela Schusová, Jaime Andrés Villagómez* ***Eliška Vítková*** *Jaime Andrés Villagómez (Gar.)*	ZK	1	0P+0C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12N3Q--JZ Name=2012 N 3.sem povinná jazyková zkouška**

2041081	English - Master Exam	ZK	1
Mapped to the level of Common European Framework of Reference: A2. Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2041086	Czech- Master Exam	ZK	1
2041083	French - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041082	German - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041085	Russian - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041084	Spanish - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			

Code of the group: 12NS*1Q-VMI
Name of the group: 2012 NSTI 1.sem 1povvol VMI
Requirement credits in the group: In this group you have to gain 4 credits
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 4
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
2182001	**Physical chemistry** *Jaromír Štancl* ***Radek Šulc*** *Radek Šulc (Gar.)*	KZ	4	2P+1C	*	PV
2022010	**Physical Foundations of Advanced Technologies** *Tomáš Horažďovský, Petr Vlčák, Zdeněk Tolde Petr Vlčák (Gar.)*	KZ	4	2P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*1Q-VMI Name=2012 NSTI 1.sem 1povvol VMI

2182001	Physical chemistry	KZ	4
Basic principles of physical chemistry in the field assuming real behavior especially that are demonstrated on technical applications. Volumetric properties of fluids. Thermodynamic properties of fluids. Phase equilibria. Solution Thermodynamics. Thermochemistry. Chemical reaction equilibrium.			
2022010	Physical Foundations of Advanced Technologies	KZ	4
Vacuum technology : theoretical foundations, vacuum pumps, gauges for low pressure measurements, applications in engineering. Gas discharges, physical and plasmochemical methods of surface modification and coatings deposition. Lasers: laser fundamentals, laser categories, laser technology application in mechanical engineering. Piezoelectricity : fundamentals, application in technology, ultrasound generation, piezoelectric pumps, nanofeeds.			

Code of the group: 12NS*3Q-VMI
Name of the group: 2012 NSTI 3.sem 1povvol VMI
Requirement credits in the group: In this group you have to gain 5 credits
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 5
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
2332010	**Design of the production of castings, forgings, stampings and welded parts**	KZ	5	1P+4C	Z	PV
2322043	**Project-heat treatment** ***Elena Čižmárová***	KZ	5	1P+4C	*	PV
2342119	**Technical Standardization, Quality, Metrology** ***Pavel Novák***	KZ	5	1P+4C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*3Q-VMI Name=2012 NSTI 3.sem 1povvol VMI

2332010	Design of the production of castings, forgings, stampings and welded parts	KZ	5
Principles for the preparation of production of machine parts with respect to the required quality and production efficiencies. Design of manufacturing processes, tools, equipment and machinery in foundries, smitheries, mills and welding shops. Adjustments to design machine parts with regard to manufacturing technology, materials and prescribed volume production. Determination of technological additions, production conditions, parameters and production times. Basic capacity calculations. Data for cost calculation. Design and comparison of alternatives.			
2322043	Project-heat treatment	KZ	5
2342119	Technical Standardization, Quality, Metrology	KZ	5
The course aims to zoom coherence to students of technical standardization, metrology and quality and to acquaint them with the basic themes of these fields.			

Code of the group: 12NS*4Q-VMI-DP
Name of the group: 2012 NSTI 4.sem 1povvol VMI - DP
Requirement credits in the group: In this group you have to gain 10 credits
Requirement courses in the group: In this group you have to complete 1 course
Credits in the group: 10
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
2323998	**Thesis**	Z	10	0P+10C	*	PV
2333998	**Diploma Thesis** ***Aleš Herman***	Z	10	0P+10C	*	PV
2343998	**Diploma thesis** ***Pavel Novák***	Z	10	0P+10C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*4Q-VMI-DP Name=2012 NSTI 4.sem 1povvol VMI - DP

2323998	Thesis	Z	10
Preparation of a thesis under the instructions and guidance of a supervisor.			
2333998	Diploma Thesis	Z	10
2343998	Diploma thesis	Z	10
Sources of information in the field. Databases and corporate literature. Normalization. Search activity. News from the field of engineering technology. Principles of research and work in laboratories. The principles of work safety in technological devices. Work on specialized tasks related to the focus of a thesis.			

Code of the group: 12NS*4Q-VMI
Name of the group: 2012 NSTI 4.sem 3povvol VMI
Requirement credits in the group: In this group you have to gain at least 15 credits (at most 18)
Requirement courses in the group: In this group you have to complete 3 courses
Credits in the group: 15
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
2321504	**Experimental Methods in Materials Science** ***Jana Sobotová***	Z,ZK	6	2P+2C	*	PV
2321080	**Material Engineering** ***Jana Sobotová***	Z,ZK	5	2P+2C	*	PV
2331027	**Metallurgy of Casting Alloys** ***Irena Kubelková***	Z,ZK	5	2P+2C	*	PV
2321074	**Nano and Biomaterials**	Z,ZK	5	2P+2C	*	PV
2331076	**Design of Surface Treatment**	Z,ZK	5	2P+2C	*	PV
2341702	**Industrial Metrology** *Libor Beránek, Petr Mikeš, Jan Urban* ***Pavel Novák*** *Libor Beránek (Gar.)*	Z,ZK	5	2P+2C	*	PV
2341063	**Technology of cutting with CAM** ***Pavel Novák***	Z,ZK	6	2P+2C	*	PV
2331507	**Processing Technology of Plastics and Composites** ***Barbora Bryksí Stunová***	Z,ZK	6	2P+2C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*4Q-VMI Name=2012 NSTI 4.sem 3povvol VMI

2321504	Experimental Methods in Materials Science	Z,ZK	6
Methods of diffraction of X-ray and electron diffraction (for the phase analysis to determine the residual stress, texture and analysis of lattice defects). Imaging methods: light and electron microscopy (preparation of sample and display characteristics, contrast theory). Advanced methods of physical and chemical microanalysis: scan-ning electron microscopy (emission, transmission and conductivity method). Electron probe microanalysis: wave-length and energy-dispersive X-ray spectroscopy, quantitative microanalysis, signal processing.			
2321080	Material Engineering	Z,ZK	5
The course is an analysis of the fundamental approaches materials engineering as an interdisciplinary field of study which is based on physics, chemistry and other technical fields, but is also interested in knowledge of medicine, economics and ecology. It follows the courses Physical metallurgy, metal and non-metallic materials.			
2331027	Metallurgy of Casting Alloys	Z,ZK	5
The course is aimed at increasing knowledge of basic studies of foundry technology. It focuses mainly on the following topics: melting of gray iron, metallurgical treatment and its influence on the structure and properties of gray iron; production of the ductile cast iron; inoculation and modification of cast irons; production of the vermicular, malleable iron and of other special cast iron types; production and metallurgical treatment of cast steel; production and metallurgical treatment of aluminum and magnesium alloys; melt quality assurance methods; casting defects.			
2321074	Nano and Biomaterials	Z,ZK	5
Introduction to nanomaterials and nanotechnology, links between nanomaterials and biomaterials, nanopowders, nanotubes, fluereny, surface and nanomaterials, practical application - industry, energy, medicine. Properties and structure of materials and their relationship to the live system. Immune system, biocompatibility tests, sterilization. Morphology, roughness and tribological properties of the surface of biomaterials. Application of thin films and coatings.			
2331076	Design of Surface Treatment	Z,ZK	5
Subject is specialized to design of convenient technology and operations surface treatments. Takes respect up to material, quality, construction and enviroment engineering parts. And also tekes respect up to best accessible techniques agreable integrated prevention dle EU laws.			
2341702	Industrial Metrology	Z,ZK	5
Theoretical introduction to measurement on coordinate measuring machines (CMMs). Students will acquainted familiar with the construction and sensors of CMM. They will gain important knowledge of computer tomography and reverse engineering. We introduce them to the CMM application in industry. This is related to method of MSA, including the determination of measurement uncertainty.			
2341063	Technology of cutting with CAM	Z,ZK	6
CAM systems for NC program generation for milling and turning operation. CAM system structure and new CNC technologies.			
2331507	Processing Technology of Plastics and Composites	Z,ZK	6

List of courses of this pass:

Code	Name of the course	Completion	Credits
2022010	Physical Foundations of Advanced Technologies	KZ	4
Vacuum technology : theoretical foundations, vacuum pumps, gauges for low pressure measurements, applications in engineering. Gas discharges, physical and plasmochemical methods of surface modification and coatings deposition. Lasers: laser fundamentals, laser categories, laser technology application in mechanical engineering. Piezoelectricity : fundamentals, application in technology, ultrasound generation, piezoelectric pumps, nanofeeds.			
2041081	English - Master Exam	ZK	1
Mapped to the level of Common European Framework of Reference: A2. Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			

2041082	German - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041083	French - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041084	Spanish - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041085	Russian - Master Exam / FME	ZK	1
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2041086	Czech- Master Exam	ZK	1
2043081	English - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language. European level A1 - A2.			
2043082	German - Lower Intermediate Course	Z	2
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.			
2043083	French - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2043084	Spanish - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2043085	Russian - Preparatory Course / FME	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2043086	Czech - Preparatory Course	Z	2
Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.			
2182001	Physical chemistry	KZ	4
Basic principles of physical chemistry in the field assuming real behavior especially that are demonstrated on technical applications. Volumetric properties of fluids. Thermodynamic properties of fluids. Phase equilibria. Solution Thermodynamics. Thermochemistry. Chemical reaction equilibrium.			
2321071	Physical metallurgy	Z,ZK	5
The course deals with the explanation of processes and procedures which form the the theoretical fundamentals of engineering and mechanical engineering technologies. Emphasis is laid on thermodynamics, diffusion, crystal lattice structures and their imperfections, phase transformations and hardening and dehardening processes. Attention is also paid to degradation processes, i.e. failure of materials, fatigue, creep, corrosion, wear and radiation failures.			
2321072	Metallic Materials	Z,ZK	5
Metallic materials. Classification of metallic materials. Low-carbon weldable steels with higher strength. Stainless steels. Austenitic stainless steels, ferritic stainless steels. Heat-resisting and creep-resisting steels. Tool steels. Non-ferrous metal alloys - basic classification. Copper and copper alloys. Aluminium and aluminium alloys. Titanium and titanium alloys. Heat treatment of metallic materials			
2321073	Non-metallic metals	Z,ZK	4
The lectures cover the entire range of non-metallic engineering materials, a majority of them are devoted to polymer materials which are most frequently used in mechanical engineering and the volume of their consumption highly exceeds that of the rest of non-metallic materials. Emphasis is laid on explanation and realization of basic terms in the field of non-metallic materials. The lectures also deal with standardization, environmental and economical aspects which follow from the different properties of non-metallic and metallic materials.			
2321074	Nano and Biomaterials	Z,ZK	5
Introduction to nanomaterials and nanotechnology, links between nanomaterials and biomaterials, nanopowders, nanotubes, fluereny, surface and nanomaterials, practical application - industry, energy, medicine. Properties and structure of materials and their relationship to the live system. Immune system, biocompatibility tests, sterilization. Morphology, roughness and tribological properties of the surface of biomaterials. Application of thin films and coatings.			
2321075	Integrity of materials	Z,ZK	4
Dealing with tasks of continuum mechanics; finite element method. Matrix and tensor calculus of stress and strain. Linear and nonlinear fracture mechanics. Assessment of conditions of integrity of structures, operation, safety and reliability of structures with defects.			
2321080	Material Engineering	Z,ZK	5
The course is an analysis of the fundamental approaches materials engineering as an interdisciplinary field of study which is based on physics, chemistry and other technical fields, but is also interested in knowledge of medicine, economics and ecology. It follows the courses Physical metallurgy, metal and non-metallic materials.			
2321504	Experimental Methods in Materials Science	Z,ZK	6
Methods of diffraction of X-ray and electron diffraction (for the phase analysis to determine the residual stress, texture and analysis of lattice defects). Imaging methods: light and electron microscopy (preparation of sample and display characteristics, contrast theory). Advanced methods of physical and chemical microanalysis: scan-ning electron microscopy (emission, transmission and conductivity method). Electron probe microanalysis: wave-length and energy-dispersive X-ray spectroscopy, quantitative microanalysis, signal processing.			
2322042	Advanced materials in engineering	KZ	4
Subject promising materials provide an overview of selected recent construction materials. It is presented the development and the physico-mechanical properties of these materials and listed the most common types of these materials. Demonstrated their fundamental characteristics, including economic considerations and international manufacturers. They presented their technological capabilities, usability and design methods for marking.			
2322043	Project-heat treatment	KZ	5
2323998	Thesis	Z	10
Preparation of a thesis under the instructions and guidance of a supervisor.			
2331012	Theory and Practise of Metal Forming	Z,ZK	5
Fundamentals of metal forming theory. Stress-strain relationships in elasticity and plasticity. Methods for analyzing metalworking processes. Workability of metals. Individual constraints in metalforming and their influence on the forming process. Fundamentals of theory and practice of basic bulk metal and sheet metalworking processes. Calculation of energy and loads in forming, selection of forming equipment.			

2331027	Metallurgy of Casting Alloys	Z,ZK	5
The course is aimed at increasing knowledge of basic studies of foundry technology. It focuses mainly on the following topics: melting of gray iron, metallurgical treatment and its influence on the structure and properties of gray iron; production of the ductile cast iron; inoculation and modification of cast irons; production of the vermicular, malleable iron and of other special cast iron types; production and metallurgical treatment of cast steel; production and metallurgical treatment of aluminum and magnesium alloys; melt quality assurance methods; casting defects.			
2331076	Design of Surface Treatment	Z,ZK	5
Subject is specialized to design of convenient technology and operations surface treatments. Takes respect up to material, quality, construction and enviroment engineering parts. And also tekes respect up to best accessible techniques agreable integrated prevention dle EU laws.			
2331090	Theory of Casting	Z,ZK	5
Properties of liquid alloys. Crystallization of foundry alloys. Volume changes during cooling and solidification, and their consequences. Principles of Feeding. Controlled solidification. Interaction the metal with the mold. Defects resulting from shrinkage. Cast iron with lamellar graphite. Cast iron with spheroidal graphite. Malleable cast iron. Cast iron with vermicular graphite. Iron for special use. Metallurgy of steel. Metallurgy of aluminum alloys, magnesium and titanium. Alloys of copper.			
2331097	Theory of Joining and Cutting	Z,ZK	5
Course covers technologies of welding, brazing and thermal cutting. Description of joining methods, their principals, equipment and typical application in the industry is done. In focus are welding technologies (SMAW, GMAW, GTAW, SAW), oxyacetylene cutting, plasma cutting. Covered is also topic of material weldability and assessment of joint quality by destructive and non-destructive methods.			
2331507	Processing Technology of Plastics and Composites	Z,ZK	6
2332010	Design of the production of castings, forgings, stampings and welded parts	KZ	5
Principles for the preparation of production of machine parts with respect to the required quality and production efficiencies. Design of manufacturing processes, tools, equipment and machinery in foundries, smitheries, mills and welding shops. Adjustments to design machine parts with regard to manufacturing technology, materials and prescribed volume production. Determination of technological additions, production conditions, parameters and production times. Basic capacity calculations. Data for cost calculation. Design and comparison of alternatives.			
2332025	Special Technologies of Surface Treatments	KZ	4
Special surface treatment technology , advanced technology trends. Measurement of process parameters in surface technology , computer technology in the management and control of surface treatment . Special surface preparation , combined pretreatment , pretreatment quality control . Conversion layer , in-process protection, anodic oxidation. Testing and quality control of surface treatments. Ways of creating functional coatings , verification of performance . Finishes to heat and abrasion, special skid coatings . Abrasion resistance , tribological properties. Galvanic alloy and composite coatings. Thermally sprayed coatings and their composition. Hot-dip coated in molten metals. Electroforming , the excretion of heavy coatings. Molds for engineering technology methods of surface treatment. Finishes in electrical engineering and electronics. Surface finishing machine tools. Coatings with nanoparticles . Disposal of waste water and environmental issues . Techno-economic indicators finishes.			
2332114	Project II	KZ	5
The subject deals with the usage of computer aided techniques in production processes of forming, casting and welding. Basic characteristics of the software FORGE, PAMSTAMP, QForm, Novacast, ProCAST, MagmaSoft and SYSWELD with demonstration of selected examples.			
2333998	Diploma Thesis	Z	10
2341004	Manufacturing systems design	Z,ZK	4
Theory and methodology of technological designing, time and spatial structures of production systems. The aim of the course is to teach students with modern approaches and methodology of production systems designing with respect to their flexibility, productivity and production quality. Introduct students to the complex design of production systems within the supply chain. Students will be acquainted with modern methods of industrial engineering and lean manufacturing.			
2341063	Technology of cutting with CAM	Z,ZK	6
CAM systems for NC program generation for milling and turning operation. CAM system structure and new CNC technologies.			
2341066	Programming of metal cutting on CNC machines	Z,ZK	5
Processing mock-up for casting, let us say mock-up of die tool models to the form of NC programme for CNC controlled milling machine. Usage of CAM system. Optimalization of tool paths with reference to cycle time and achieved quality of finished machined surface.			
2341082	Non-convetional material removal processes	Z,ZK	4
Basic working principles, current machining apllications, future development. Electrodischarge machining - principle, mechanism of material removal, hole and 3 - D schapes production, wire electrodischarge maschining. The utilization of the energy beams for machining - laser, electron and ion beams, plasma arc. Electrochemical machining - basic principle, applications, full - form shaping. Chemical machining. Water - jet and ultrasonic machining. Technological, economical and surface quality consideration when using nonconventional processes.Environmental and Safety Aspacts of Electrophysical and Electrochemical Processes.			
2341702	Industrial Metrology	Z,ZK	5
Theoretical introduction to measurement on coordinate measuring machines (CMMs). Students will acquainted familiar with the construction and sensors of CMM. They will gain important knowledge of computer tomography and reverse engineering. We introduce them to the CMM application in industry. This is related to method of MSA, including the determination of measurement uncertainty.			
2342114	Project III.	KZ	5
Course is focused on solving a complex tasts from the field of machining, process planning and metrology.			
2342119	Technical Standardization, Quality, Metrology	KZ	5
The course aims to zoom coherence to students of technical standardization, metrology and quality and to acquaint them with the basic themes of these fields.			
2343998	Diploma thesis	Z	10
Sources of information in the field. Databases and corporate literature. Normalization. Search activity. News from the field of engineering technology. Principles of research and work in laboratories. The principles of work safety in technological devices. Work on specialized tasks related to the focus of a thesis.			
2382052	Business and Management	KZ	3
This course introduces entrepreneurship as a way relevant to student's future professional career. Technically oriented students who haven't any specialized economical and management courses in their curriculum are introduced to the fundamental issues needed to start of their own businesses using simple and understandable form. To study the basic information of individual topics e-learning materials accessible on the web portal are prepared. Acquired knowledge is then practiced at workshops involving external lectors. Evaluation and classification is based on the e-learning tests and student?s case study, related to small business issues (mostly the business plan of a start-up company).			

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