Study plan

Name of study plan: 13 136 NSTI MMT 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: 157
Elective courses credits: -28
Sum of credits in the plan: 129
Note on the plan:

Name of the block: Compulsory courses in the program
Minimal number of credits of the block: 122
The role of the block: P

Code of the group: 12NS*1P-MMT
Name of the group: 2012 NSTI 1.sem povinné MMT
Requirement credits in the group: In this group you have to gain 31 credits
Requirement courses in the group: In this group you have to complete 8 courses
Credits in the group: 31
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
2013054	**Mathematics for Mechanics** ***Petr Sváček***	Z	4	3P+1C	*	P
2311075	**Mechanics of Mechanisms** *Jan Pelikán, Václav Bauma, Petr Beneš, Zdeněk Neusser, Zbyněk Šika, Michael Valášek, Jan Zavřel* ***Zbyněk Šika*** *Zbyněk Šika (Gar.)*	ZK	4	3P+0C	*	P
2141093	**Microelectronics** *Lukáš Novák, Stanislava Papežová* ***Stanislava Papežová*** *Lukáš Novák (Gar.)*	Z,ZK	3	2P+0C+1L	*	P
2012018	**Ordinary Differential Equations** *Tomáš Neustupa, Luděk Beneš Tomáš Neustupa (Gar.)*	KZ	3	2P+1C	*	P
2013111	**Project I** *Luděk Beneš, Jan Valášek, Petr Louda, Vladimír Prokop, Ivana Linkeová, Jan Halama, Jiří Fürst, Jaroslav Fořt, Gejza Dohnal, ...* ***Jiří Fürst*** *Jan Halama (Gar.)*	Z	5	0P+5C	*	P
2121016	**Theoretical Fluid Mechanics** *Tomáš Hyhlík Tomáš Hyhlík (Gar.)*	ZK	4	3P+0C	*	P

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

2013054	Mathematics for Mechanics	Z	4
Summary: Tensor calculus. Introduction to functional analysis. Calculus of variations. Orthogonal transformation of coordinate systems. Afinne orthogonal tensors and tensor operations. Tensor as linear operator and bilinear form. Metrics and metric spaces. Convergence. Completness. Linear normed space. Banach space. Linear space with scalar product (unitary space). Hilbert space. Contractive operators and Banach fixed point theorem. Function spaces in examples. Operators and functionals. Linear, continuous and bounded operator/functional. Derivative of a functional in the given direction. Gateaux differential and derivative. Necessary and sufficient conditions for extremes of a functional. Convex set and convex functional. Minimum of convex functional. Extremes of functional of different types. Euler equation. Necessary and sufficient conditions for extrema. Discrete methods for approximation of the minima of an functional. Ritz method.			
2311075	Mechanics of Mechanisms	ZK	4
2141093	Microelectronics	Z,ZK	3
Basic characteristics of logic circuits and programmable logical systems, input and output circuits - voltage and current matching, D/A and A/D converters, coding, lines and protocols of communications, electronic and optoelectronic parts for microelectronics, microprocessor system applications.			
2012018	Ordinary Differential Equations	KZ	3
The course expect the understanding of the subjects of previous study on "Alpha" level. Outline of concepts and technics of solving differential equations of first order. Autonomous systems. Geometrical aspects of phase plane. Stability of solution.			
2013111	Project I	Z	5
2121016	Theoretical Fluid Mechanics	ZK	4
The study subject aim is to expand the students knowledge gained from the previous subject Thermomechanics Alfa. The attention is focussed namely on fluids characteristics, various description methods of fluid dynamics under low and high Re number values, boundary layer characteristics and its stability and complex flow characteristics for incompressible flow.			

Code of the group: 12NS*2P-MMT
Name of the group: 2012 NSTI 2.sem povinné MMT
Requirement credits in the group: In this group you have to gain 29 credits
Requirement courses in the group: In this group you have to complete 9 courses
Credits in the group: 29
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
2013030	**Numerical Solution of Ordinary and Partial Differential Equations** *Luděk Beneš, Jan Halama* ***Jan Halama*** *Jan Halama (Gar.)*	Z	2	2P+0C	*	P
2011088	**Partial Differential Equations I** *Stanislav Kračmar* ***Stanislav Kračmar*** *Stanislav Kračmar (Gar.)*	ZK	5	2P+1C	*	P
2012030	**Probability and Statistics** ***Gejza Dohnal***	KZ	2	2P+0C	*	P
2013112	**Project II** *Luděk Beneš, Jan Valášek, Vladimír Prokop, Ivana Linkeová, Jan Halama, Jiří Fürst, Jaroslav Fořt, Petr Sváček, Jan Karel, ...* ***Jiří Fürst*** *Jan Halama (Gar.)*	Z	5	0P+5C	*	P
2123018	**Heat and Mass Transfer** *Pavel Sláma*	Z	2	2P+0C	*	P
2311076	**Simulation of Mechatronic Systems** *Jan Pelikán, Václav Bauma, Zbyněk Šika, Michael Valášek, Jan Zavřel* ***Zbyněk Šika*** *Zbyněk Šika (Gar.)*	ZK	3	2P+0C	*	P
2111049	**Theory of elasticity** *Dušan Gabriel* ***Dušan Gabriel*** *Dušan Gabriel (Gar.)*	ZK	4	3P+0C	*	P
2121055	**Thermodynamics** *Tomáš Hyhlík Tomáš Hyhlík (Gar.)*	ZK	4	3P+0C	*	P

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

2013030	Numerical Solution of Ordinary and Partial Differential Equations	Z	2

Course covers the overview of clasical numerical methods for the solution of evolution problems for ODEs and PDEs. Students get familiar with discretization errors, stability of schemes and convergence of solution. Emphasis is put on a practical use of numerical methods (choice of method, discretization, ...).

2011088	Partial Differential Equations I	ZK	5

The course contains the essential parts of the classical theory of partial differential equations (PDE), first-order equations, the classification of second-order equations, the derivation of some important equations of mathematical physics, the method of characteristics, the Fourier method of the series. The theory of elliptical equations, principles of maxima, the uniqueness of solutions, potential methods, the concept of a fundamental solution and the method of the Green functions will be discussed in more detail. Students will be acquainted with the apparatus used in the field of partial differential equations: Fourier transform and its use. Distributions and generalized derivatives. Important inequalities: Friedrich's inequality, Poincare's inequality, Minkowsky inequality, Mathematical means used in the so-called modern PDE theory will be discussed, the basis of which will be the subject of PDE II: Fundamentals of functional analysis: Hilbert spaces, Banach spaces, and their properties, linear operators in these spaces. Riesz's theorem. The concept of the continuous embedding and the compact embedding. Convergent and weakly convergent sequences. Sobolev spaces, the theorem on the equivalence of norms, the theorem on traces of functions from Sobolev's space, assertions on continuous and compact embeddings of Sobolev spaces. Introduction in variational methods of PDE. Using the results of the functional analysis to introduce and study weak solutions of elliptic, parabolic and hyperbolic equations.

2012030	Probability and Statistics	KZ	2
2013112	Project II	Z	5
2123018	Heat and Mass Transfer	Z	2

The course extends the knowledge gained in the subject Thermomechanics Alfa especially in the area of heat transfer. Attention is paid to more complex cases (non-stationary, multidimensional problems) as well as to processes where heat transfer is accompanied by simultaneous mass transfer (mixing exchangers).

2311076	Simulation of Mechatronic Systems	ZK	3
2111049	Theory of elasticity	ZK	4

The objective of this course is an introduction to the theory and applications of linear elasticity.It also provides the foundation for pursuing other solid mechanics courses such as theory of plasticity, fracture mechanics, composite structures, theory of plates and shells or continuum mechanics. This course introduces the basic definitions of stress and strain tensors used in the linear theory of elasticity, determines the principal stress and strain, derives equilibrium equations, compatibility conditions for strain tensor, postulates the constitutive relations for linear elastic material (generalized Hooke's law).The governing differential equations of elasticity are derived including the Navier's equation expressed in terms of the displacement vector and the Beltrami-Michell's equation expressed in terms of the stress tensor. Next, two-dimensional problems in cartesian and cylindrical coordinate systems is considered andthe Airy stress function is introduced for the solution of these problems. A few useful application are studied such as bending of a beam using the Airy stress function in the form of a polynomial, the stress distibution in a plate with small circular hole submitted to a uniform tension, the stress distibution for a concentrated vertical force action on a horizontal straight boundary, the stress distibution in a wedge due to a concentrated force at its apex. Finally, a brief introduction to the energy principles in solid mechanics is presented including the principles of virtual displacements and virtual forces.

2121055	Thermodynamics	ZK	4

The aim of the course is to expand the students' knowledge gained from the previous course Thermomechanics Alfa in the areas of the real gas thermodynamics, irreversible process thermodynamics, multiphase- and multicomponent system characteristics and thermodynamics cycles of the real heat engines and machines also.

Code of the group: 12NS*3P-MMT
Name of the group: 2012 NSTI 3.sem povinné MMT
Requirement credits in the group: In this group you have to gain 30 credits
Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 30
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
2011098	**Dynamic Systems**	ZK	5	3P+0C	*	P
2011083	**Mathematical Modeling of Flow Problems** *Jan Halama, Jiří Fürst **Jiří Fürst** Jiří Fürst (Gar.)*	ZK	6	3P+1C	*	P
2111019	**Continuum Mechanics**	ZK	5	3P+0C	*	P
2121043	**Computational Fluid Mechanics** ***Tomáš Hyhlík***	ZK	4	3P+0C	*	P
2013113	**Project III** *Luděk Beneš, Jan Valášek, Vladimír Prokop, Ivana Linkeová, Jan Halama, Jiří Fürst, Petr Sváček, Jan Karel, Jiří Holman, ... **Jiří Fürst** Jan Halama (Gar.)*	Z	10	0P+10C	*	P

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

2011098	Dynamic Systems	ZK	5
2011083	Mathematical Modeling of Flow Problems	ZK	6
2111019	Continuum Mechanics	ZK	5
2121043	Computational Fluid Mechanics	ZK	4
This course extends the knowledge gained in the course of Fluid Mechanics about the knowledge of computational fluid dynamics. Emphasis is placed on understanding the basic principles of computational fluid dynamics based on using commercial codes. Selected problems of internal and external aerodynamics are solved.			
2013113	Project III	Z	10

Code of the group: 12NS*4P-MMT
Name of the group: 2012 NSTI 4.sem povinné MMT
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: není sepsán 2013998 DP

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
2013998	**Diploma Thesis** *Luděk Beneš, Jan Valášek, Vladimír Prokop, Ivana Linkeová, Jan Halama, Jiří Fürst, Jaroslav Fořt, Petr Sváček, Jan Karel, ... Jan Halama (Gar.)*	Z	10	0P+10C		P
2121056	**Gas Dynamics** *Michal Schmirler Michal Schmirler (Gar.)*	ZK	4	3P+0C	*	P
2011069	**Finite Element Method in Applications** *Petr Sváček **Petr Sváček** Petr Sváček (Gar.)*	ZK	4	2P+0C	*	P
2013055	**Numerical Methods in Engineering** ***Tomáš Bodnár***	Z	3	3P+0C	*	P
2011084	**Numerical Simulations of Flow in Engineering Applications** ***Petr Louda***	ZK	4	2P+0C	*	P
2011089	**Partial Differential Equations II**	ZK	4	2P+0C	*	P
2311019	**Synthesis and Optimization of Mechanical Systems** *Václav Bauma, Petr Beneš, Zbyněk Šika, Michael Valášek, Jan Zavřel **Zbyněk Šika** Zbyněk Šika (Gar.)*	ZK	3	2P+0C	*	P

Characteristics of the courses of this group of Study Plan: Code=12NS*4P-MMT Name=2012 NSTI 4.sem povinné MMT

2013998	Diploma Thesis	Z	10
2121056	Gas Dynamics	ZK	4
The study subjects aim is to expand the students´ knowledge gained from the previous Alfa versions of the bachelors subjects Fluid Mechanics and Thermomechanics. It generalizes the findings in the scope of compressible fluid flow; the attention is focussed on the several non-isentropic cycles as well as fundaments of non-stationary and multidimensional flows.			
2011069	Finite Element Method in Applications	ZK	4
Mathematical background of the finite element method. Banach and Hilbert spaces. Linear forms, bilinear forms, scalar product. Hölder and Cauchy inequality. Lax-Milgram theorem. Lebesgue and Sobolev spaces. Sobolev imbeddings theorem and the trace theorem. Green theorem. Substitution theorem. Poincare-Friedrichs inequality. Basic principle of the finite element method. Example of application for 1D problem, classical and weak solution, error estimates. Abstract variational formulation, Ritz and Galerkin problem. Existence and uniqness of the solution. Discrete Ritz and Galerkin problems. Cea's lemma (error estimate).			
2013055	Numerical Methods in Engineering	Z	3
2011084	Numerical Simulations of Flow in Engineering Applications	ZK	4
2011089	Partial Differential Equations II	ZK	4
2311019	Synthesis and Optimization of Mechanical Systems	ZK	3

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 35

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*4Q-MMT
Name of the group: 2012 NSTI 4.sem 1povvol MMT
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:

List of courses of this pass:

Code	Name of the course	Completion	Credits
2011069	Finite Element Method in Applications	ZK	4
Mathematical background of the finite element method. Banach and Hilbert spaces. Linear forms, bilinear forms, scalar product. Hölder and Cauchy inequality. Lax-Milgram theorem. Lebesgue and Sobolev spaces. Sobolev imbeddings theorem and the trace theorem. Green theorem. Substitution theorem. Poincare-Friedrichs inequality. Basic principle of the finite element method. Example of application for 1D problem, classical and weak solution, error estimates. Abstract variational formulation, Ritz and Galerkin problem. Existence and uniquness of the solution. Discrete Ritz and Galerkin problems. Cea's lemma (error estimate).			
2011083	Mathematical Modeling of Flow Problems	ZK	6
2011084	Numerical Simulations of Flow in Engineering Applications	ZK	4
2011088	Partial Differential Equations I	ZK	5
The course contains the essential parts of the classical theory of partial differential equations (PDE), first-order equations, the classification of second-order equations, the derivation of some important equations of mathematical physics, the method of characteristics, the Fourier method of the series. The theory of elliptical equations, principles of maxima, the uniqueness of solutions, potential methods, the concept of a fundamental solution and the method of the Green functions will be discussed in more detail. Students will be acquainted with the apparatus used in the field of partial differential equations: Fourier transform and its use. Distributions and generalized derivatives. Important inequalities: Friedrich's inequality, Poincare's inequality, Minkowsky inequality, Mathematical means used in the so-called modern PDE theory will be discussed, the basis of which will be the subject of PDE II: Fundamentals of functional analysis: Hilbert spaces, Banach spaces, and their properties, linear operators in these spaces. Riesz's theorem. The concept of the continuous embedding and the compact embedding. Convergent and weakly convergent sequences. Sobolev spaces, the theorem on the equivalence of norms, the theorem on traces of functions from Sobolev's space, assertions on continuous and compact embeddings of Sobolev spaces. Introduction in variational methods of PDE. Using the results of the functional analysis to introduce and study weak solutions of elliptic, parabolic and hyperbolic equations.			
2011089	Partial Differential Equations II	ZK	4
2011098	Dynamic Systems	ZK	5
2012018	Ordinary Differential Equations	KZ	3
The course expect the understanding of the subjects of previous study on "Alpha" level. Outline of concepts and technics of solving differential equations of first order. Autonomous systems. Geometrical aspects of phase plane. Stability of solution.			
2012030	Probability and Statistics	KZ	2
2013030	Numerical Solution of Ordinary and Partial Differential Equations	Z	2
Course covers the overview of clasical numerical methods for the solution of evolution problems for ODEs and PDEs. Students get familiar with discretization errors, stability of schemes and convergence of solution. Emphasis is put on a practical use of numerical methods (choice of method, discretization, ...).			

2013054	Mathematics for Mechanics	Z	4
Summary: Tensor calculus. Introduction to functional analysis. Calculus of variations. Orthogonal transformation of coordinate systems. Afinne orthogonal tensors and tensor operations. Tensor as linear operator and bilinear form. Metrics and metric spaces. Convergence. Completness. Linear normed space. Banach space. Linear space with scalar product (unitary space). Hilbert space. Contractive operators and Banach fixed point theorem. Function spaces in examples. Operators and functionals. Linear, continuous and bounded operator/functional. Derivative of a functional in the given direction. Gateaux differential and derivative. Necessary and sufficient conditions for extremes of a functional. Convex set and convex functional. Minimum of convex functional. Extremes of functional of different types. Euler equation. Necessary and sufficient conditions for extrema. Discrete methods for approximation of the minima of an functional. Ritz method.			
2013055	Numerical Methods in Engineering	Z	3
2013111	Project I	Z	5
2013112	Project II	Z	5
2013113	Project III	Z	10
2013998	Diploma Thesis	Z	10
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.			
2111019	Continuum Mechanics	ZK	5
2111049	Theory of elasticity	ZK	4
The objective of this course is an introduction to the theory and applications of linear elasticity.It also provides the foundation for pursuing other solid mechanics courses such as theory of plasticity, fracture mechanics, composite structures, theory of plates and shells or continuum mechanics. This course introduces the basic definitions of stress and strain tensors used in the linear theory of elasticity, determines the principal stress and strain, derives equilibrium equations, compatibility conditions for strain tensor, postulates the constitutive relations for linear elastic material (generalized Hooke's law).The governing differential equations of elasticity are derived including the Navier's equation expressed in terms of the displacement vector and the Beltrami-Michell's equation expressed in terms of the stress tensor. Next, two-dimensional problems in cartesian and cylindrical coordinate systems is considered andthe Airy stress function is introduced for the solution of these problems. A few useful application are studied such as bending of a beam using the Airy stress function in the form of a polynomial, the stress distibution in a plate with small circular hole submitted to a uniform tension, the stress distibution for a concentrated vertical force action on a horizontal straight boundary, the stress distibution in a wedge due to a concentrated force at its apex. Finally, a brief introduction to the energy principles in solid mechanics is presented including the principles of virtual displacements and virtual forces.			
2121016	Theoretical Fluid Mechanics	ZK	4
The study subject aim is to expand the students knowledge gained from the previous subject Thermomechanics Alfa. The attention is focussed namely on fluids characteristics, various description methods of fluid dynamics under low and high Re number values, boundary layer characteristics and its stability and complex flow characteristics for incompressible flow.			
2121043	Computational Fluid Mechanics	ZK	4
This course extends the knowledge gained in the course of Fluid Mechanics about the knowledge of computational fluid dynamics. Emphasis is placed on understanding the basic principles of computational fluid dynamics based on using commercial codes. Selected problems of internal and external aerodynamics are solved.			
2121055	Thermodynamics	ZK	4
The aim of the course is to expand the students' knowledge gained from the previous course Thermomechanics Alfa in the areas of the real gas thermodynamics, irreversible process thermodynamics, multiphase- and multicomponent system characteristics and thermodynamics cycles of the real heat engines and machines also.			
2121056	Gas Dynamics	ZK	4
The study subjects aim is to expand the students´ knowledge gained from the previous Alfa versions of the bachelors subjects Fluid Mechanics and Thermomechanics. It generalizes the findings in the scope of compressible fluid flow; the attention is focussed on the several non-isentropic cycles as well as fundaments of non-stationary and multidimensional flows.			

2123018	Heat and Mass Transfer	Z	2
The course extends the knowledge gained in the subject Thermomechanics Alfa especially in the area of heat transfer. Attention is paid to more complex cases (non-stationary, multidimensional problems) as well as to processes where heat transfer is accompanied by simultaneous mass transfer (mixing exchangers).			
2141093	Microelectronics	Z,ZK	3
Basic characteristics of logic circuits and programmable logical systems, input and output circuits - voltage and current matching, D/A and A/D converters, coding, lines and protocols of communications, electronic and optoelectronic parts for microelectronics, microprocessor system applications.			
2311019	Synthesis and Optimization of Mechanical Systems	ZK	3
2311075	Mechanics of Mechanisms	ZK	4
2311076	Simulation of Mechatronic Systems	ZK	3

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