

Study plan

Name of study plan: 02 098 NSTI ENE 2012 základ

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Mechanical Engineering

Type of study: Follow-up master

Required credits: 114

Elective courses credits: 5

Sum of credits in the plan: 119

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 54

The role of the block: P

Code of the group: 12NS*1P-ENE

Name of the group: 2012 NSTI 1.sem povinné ENE

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 5 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2153051	Project I. <i>Pavel Skopec</i>	Z	5	0P+5C	*	P
2371519	Means of Automatic Control I.	Z,ZK	6	3P+0C+2L	*	P
2161004	Environmental engineering	Z,ZK	6	3P+2C	*	P
2181136	Processing Equipments Design	Z,ZK	6	3P+2C	*	P
2151026	Energy Sources and Conversions	Z,ZK	6	3P+2C	*	P

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

2153051	Project I.	Z	5
2371519	Means of Automatic Control I. Various categories of means for automatic control according to the different criterions. Main features in each category. Air and hydraulic fluid as a medium for information transfer. Symbols and descriptions in pneumatic and hydraulic diagrams. Pneumatic control systems design. Pneumatic actuators, valves, special pneumatic, electropneumatic devices. Control valves, categories, dimensioning, design, applications. Intelligent pneumatics as an integration of pneumatic, electronic and control components and systems. Valve islands and terminals, standard, with industrial buses communication, programmable. Pneumatic positioning systems.	Z,ZK	6
2161004	Environmental engineering Application of a theory in environmental engineering	Z,ZK	6
2181136	Processing Equipments Design PEs classification, their parameters and criteria of their rating. Ways of PEs design according their purpose and utilization. Materials used for PEs, welding, corrosion mechanisms and anticorrosion prevention. Dimension of shafts, beams, supports, pipes, heat exchangers and pressure vessels. Sealing and packing of fix parts (flanges) and moving parts (rotating shafts etc.). Practical examples of proper and improper designs of apparatuses. Example of heat exchanger design (heat transfer area calculation, its arrangement, head loss calculation, thermal dilatation, strength calculation, low cycle fatigue (thermal dilatation)).	Z,ZK	6
2151026	Energy Sources and Conversions	Z,ZK	6

Code of the group: 12NS*2P-ENE

Name of the group: 2012 NSTI 2.sem povinné ENE

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 2 courses

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2153052	Project II. <i>Pavel Skopec</i>	Z	5	0P+5C	*	P
2151079	Thermal Cycles in Power Generation	Z,ZK	5	3P+1C	*	P

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

2153052	Project II.	Z	5
2151079	Thermal Cycles in Power Generation	Z,ZK	5

The lectures are focused on developing the knowledge required to analyse energy cycles performance (e.g. efficiency, power output, work and heat input) from cycle data. Steam Power (Rankine) Cycle: beginning with a simple cycle and adding more refinements (feedheating, economiser etc.). Application to electrical power generation where the heat source is supplied by: i) fossil fuel and ii) nuclear fuel. Gas Turbine (Brayton) Cycle: simple, then add intercooler, heat exchanger and reheater. The use of gas turbines for gas turbines to electrical power generation. Latest developments with concentrated solar energy as a heat source. Cooling towers. Hybrid systems: CHP, steam turbine with gas turbine. Exergy analysis of the energy cycles.

Code of the group: 12NS*3P-ENE

Name of the group: 2012 NSTI 3.sem povinné ENE

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2153053	Project III. <i>Zdeněk Funda, Ondřej Bartoš, Jakub Mašuch, Michal Kolovratník, Jan Hrdlička, Václav Novotný, Jan Havlík, Václav Dostál, Pavel Skopec, Jan Havlík</i>	Z	10	0P+10C	*	P

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

2153053	Project III.	Z	10
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Code of the group: 12NS*4P-ENE

Name of the group: 2012 NSTI 4.sem povinné ENE

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2153998	Diploma Thesis <i>Michal Kolovratník</i>	Z	10	0P+10C	*	P

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

2153998	Diploma Thesis	Z	10
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Name of the block: Compulsory elective courses

Minimal number of credits of the block: 60

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2043081	English - Preparatory Course / FME <i>Eliška Vítková, Ilona Šimice, Michaela Schusová, Veronika Kratochvílová, Hana Volejníková, Nina Procházková Ayyub</i> Nina Procházková Ayyub	Z	2	0P+2C	*	PV
2043086	Czech - Preparatory Course <i>Michaela Schusová, Hana Volejníková, Petr Laurich</i>	Z	2	0P+2C	*	PV
2043083	French - Preparatory Course / FME <i>Michaela Schusová, Dušana Jirovská</i> Michaela Schusová <i>Michaela Schusová (Gar.)</i>	Z	2	0P+2C	*	PV
2043082	German - Lower Intermediate Course <i>Eliška Vítková, Michaela Schusová, Petr Laurich, Jaroslava Kommová</i> Jaroslava Kommová	Z	2	0P+2C	*	PV
2043085	Russian - Preparatory Course / FME <i>Eliška Vítková, Michaela Schusová, Hana Volejníková, Dušana Jirovská</i> Eliška Vítková	Z	2	0P+2C	*	PV
2043084	Spanish - Preparatory Course / FME <i>Eliška Vítková, Michaela Schusová, Jaime Andrés Villagómez</i> 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 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.			
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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2041081	English - Master Exam <i>Eliška Vítková, Ilona Šimice, Michaela Schusová, Veronika Kratochvílová, Hana Volejníková, Nina Procházková Ayyub</i> Nina Procházková Ayyub	ZK	1	0P+0C	*	PV
2041086	Czech- Master Exam <i>Michaela Schusová, Hana Volejníková, Petr Laurich</i>	ZK	1	0P+0C	*	PV
2041083	French - Master Exam / FME <i>Eliška Vítková, Michaela Schusová, Dušana Jirovská</i> Dušana Jirovská <i>Michaela Schusová (Gar.)</i>	ZK	1	0P+0C	*	PV
2041082	German - Master Exam / FME <i>Eliška Vítková, Michaela Schusová, Petr Laurich, Jaroslava Kommová</i> Jaroslava Kommová	ZK	1	0P+0C	*	PV
2041085	Russian - Master Exam / FME <i>Eliška Vítková, Michaela Schusová, Hana Volejníková, Dušana Jirovská, Petr Zitko</i> Eliška Vítková	ZK	1	0P+0C	*	PV
2041084	Spanish - Master Exam / FME <i>Eliška Vítková, Michaela Schusová, Jaime Andrés Villagómez</i> Eliška Vítková	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 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 comprehension 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 comprehension 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 comprehension of simple texts. Improvement of professional language.			

Code of the group: 12NS*2Q-ENE

Name of the group: 2012 NSTI 2.sem 4povvol ENE

Requirement credits in the group: In this group you have to gain at least 19 credits (at most 20)

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 19

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2151094	Biomass and Renewable Energy Sources <i>Jan Hrdlička</i>	Z,ZK	5	2P+2C	*	PV
2121041	Pumping Technology	Z,ZK	5	3P+1C	*	PV
2151095	Nuclear Energy <i>Pavel Záchra Pavel Záchra</i>	Z,ZK	4	2P+2C	*	PV
2151089	Industrial power engineering	Z,ZK	5	2P+1C	*	PV
2151010	Combustion and Boilers <i>Jan Hrdlička</i>	Z,ZK	5	3P+1C	*	PV
2151170	Gaseous Fluids Compression and Delivery	Z,ZK	5	3P+1C	*	PV
2151157	Principles of Refrigerating Technology and Heat Pumps	Z,ZK	5	2P+2C	*	PV
2151144	Introductory Cryogenics and Vacuum Technology	Z,ZK	5	3P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*2Q-ENE Name=2012 NSTI 2.sem 4povvol ENE

2151094	Biomass and Renewable Energy Sources	Z,ZK	5
The course comprises from 1/3 of general survey of various renewable energy sources (wind, hydro, solar and geothermal power) and the other 2/3 are dedicated to origin, types, properties and energy conversion technologies of biomass.			
2121041	Pumping Technology	Z,ZK	5
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. Students will gain knowledge on basic types of hydrostatic and hydrodynamic pumps, their construction and operational characteristics. Students will also get knowledge on the fundamentals of operation of pumps in hydraulic systems and more complex overview in selecting of type, construction and operation of pumps that are used in hydraulic systems.			
2151095	Nuclear Energy	Z,ZK	4
2151089	Industrial power engineering	Z,ZK	5
2151010	Combustion and Boilers	Z,ZK	5
2151170	Gaseous Fluids Compression and Delivery	Z,ZK	5
Theory of compression processes. Constructions, calculation, capacity control of compressors, operation with various gases. Refrigerating compressors. Accessories of a compressor stations and plants. Compressed air technology. Economical and ecological problems of a compressed air production and distribution.			
2151157	Principles of Refrigerating Technology and Heat Pumps	Z,ZK	5
2151144	Introductory Cryogenics and Vacuum Technology	Z,ZK	5

Code of the group: 12NS*3Q-ENE

Name of the group: 2012 NSTI 3.sem 4povvol ENE

Requirement credits in the group: In this group you have to gain at least 16 credits (at most 20)

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 16

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4	2P+1C	*	PV
2121042	Hydrostatic Pumps and Transmission	Z,ZK	4	2P+1C	Z	PV

2151006	Nuclear Reactors and Steam Generators	Z,ZK	5	3P+1C	*	PV
2151171	Compressors - selected Parts <i>Michal Kolovratník</i>	Z,ZK	4	2P+1C	*	PV
2151037	Steam and Gas Turbines <i>Ondřej Bartoš</i>	Z,ZK	5	3P+1C	*	PV
2151115	Design and Economy of Power Facilities <i>Michal Kolovratník</i>	Z,ZK	5	3P+1C	*	PV
2151153	Design and Operation of Cooling Equipments	Z,ZK	5	2P+2C	*	PV
2152022	Social aspects of power engineering <i>Jakub Mašuch</i>	KZ	4	2P+1C	*	PV
2151084	Boiler Design <i>Zdeněk Funda</i>	Z,ZK	5	3P+1C	*	PV
2151021	District Heating <i>Zdeněk Funda</i>	Z,ZK	5	2P+2C	*	PV
2151108	Thermal Hydraulics of Nuclear Reactors	Z,ZK	5	2P+2C	*	PV

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

2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4
2121042	Hydrostatic Pumps and Transmission	Z,ZK	4
The course is considered for the students in the master study programme of Mechanical Engineering-Pumps and machinery facilities. Students will gain knowledge on basic types of hydrostatic pumps, construction and operation characteristics. The course will provide students with comprehensive overview in selecting type, construction and operation of hydraulic pumps. Students will also pass introduction to the fundamentals of hydrostatic and hydrodynamic transmissions, their characteristics, construction and applications.			
2151006	Nuclear Reactors and Steam Generators	Z,ZK	5
Problems with achievement of reactor criticality, principles of reactivity control. Fuels, moderators and structural materials for nuclear power reactors. Principal design characteristics of nuclear reactors, reactor kinetics and reactor radiation. Advanced reactors and steam generators.			
2151171	Compressors - selected Parts	Z,ZK	4
Selected parts of the theory, design and operation of positive displacement compressors (include refrigerating compressors). Non-ideal gas compression.			
2151037	Steam and Gas Turbines	Z,ZK	5
Condensing, backpressure and extraction steam turbines. Basic principals of energy transformations in a turbine stage. Turbine stage with a short (one-dimensional approach) and long (three-dimensional effects) blade. Energy losses, polytropic and isentropic turbine efficiency. Thermodynamic analysis and design of a multi-stage steam and gas turbines. Power control of a steam and gas turbines. Off-design operation conditions of a steam and gas turbines.			
2151115	Design and Economy of Power Facilities	Z,ZK	5
2151153	Design and Operation of Cooling Equipments	Z,ZK	5
2152022	Social aspects of power engineering	KZ	4
2151084	Boiler Design	Z,ZK	5
Basic types of boilers, design variants. Fuel preparation before combustion - grinding and drying of solid fuels, energy balance. Influence of steam parameters and fuel properties on boiler design - influence of calorific value, influence of water, ash, volatile chlorine and nitrogen content. Methodology of new boiler design. Power plant boilers - sub and supercritical, fluidized bed boilers. Recent trends in boiler design - options for boiler efficiency improvement. Materials for boiler construction. Boiler slave equipment - transport lines, fans, precipitators.			
2151021	District Heating	Z,ZK	5
2151108	Thermal Hydraulics of Nuclear Reactors	Z,ZK	5

Code of the group: 12NS*4Q-ENE-238

Name of the group: 2012 NSTI 4.sem 1povvol ENE

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 3)

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2383062	Budget and Project Economic Assessment <i>Miroslav Žilka Miroslav Žilka (Gar.)</i>	Z	2	1P+2C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*4Q-ENE-238 Name=2012 NSTI 4.sem 1povvol ENE

2383062	Budget and Project Economic Assessment	Z	2
The goal of the course is to improve the knowledge gained within the basic bachelor's degree course Management and Economics of the Enterprise. The course focuses primarily on deepening of basic knowledge and skills in the creation and evaluation of the operational budget, proper preparation and evaluation of costing model for manufactured products and the economic evaluation of an investment project, as it corresponds to contemporary knowledge and the development of management methods and techniques. Students specify a simple fictional industrial or engineering company or its sub-section (preferably inspired by their practical experience, internships or training program in real company). The first student's task is to prepare a detailed plan and budget of a project (e.g. new product development, product or process innovation, etc.) focused on improvement of profitability, competitiveness or effectiveness of the company. The second task is cost calculation for chosen calculation unit. Last task within this course is the evaluation of economical effectiveness of the project described within the first task. The dynamic methods like Net Present Value (NPV), Internal Rate of Return (IRR) or Discounted Payback Period (DPP) are used for this evaluation. The quality of realization and presentation of the task's outputs together with the results of the test decides on granting / denial of credit.			

Code of the group: 12NS*4Q-ENE

Name of the group: 2012 NSTI 4.sem 5povvol ENE

Requirement credits in the group: In this group you have to gain 20 credits

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 20

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2152045	Ecological Waste Treatment <i>Jan Opat il</i>	KZ	4	2P+1C	*	PV
2151137	Environmenatal Aspects of Energy Systems <i>Pavel Skopec</i>	Z,ZK	4	2P+1C	*	PV
2152029	Energy Audit <i>Michal Kolovratnik</i>	KZ	4	2P+0C	*	PV
2122041	Micro-hydro water turbines	KZ	2	2P+1C	*	PV
2152064	Measurement in the Branch	KZ	4	0P+2L	*	PV
2151059	Advanced Power Generation Systems <i>Michal Kolovratnik</i>	Z,ZK	4	2P+1C	*	PV
2151082	Operation of Power Devices <i>Zden k Funda</i>	Z,ZK	4	2P+1C	*	PV
2151080	Control and Automation Engineering in Power Industry <i>Ond ej Bartoš</i>	Z,ZK	4	2P+1C	*	PV
2151177	Thermal Insulation <i>Martin Neužil</i>	Z,ZK	4	1P+1C	*	PV
2152062	Turbocompressors and Fans	KZ	4	2P+1C	*	PV
2122022	Special Parts of Pumping Technology	KZ	4	2P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*4Q-ENE Name=2012 NSTI 4.sem 5povvol ENE

2152045	Ecological Waste Treatment	KZ	4
2151137	Environmenatal Aspects of Energy Systems	Z,ZK	4
2152029	Energy Audit	KZ	4
2122041	Micro-hydro water turbines	KZ	2
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. Students will get knowledge on basic types of water turbines, their operational characteristics, construction and applications. The course will provide students with comprehensive overview in selecting type, construction and operation of micro-hydro water turbines.			
2152064	Measurement in the Branch	KZ	4
2151059	Advanced Power Generation Systems	Z,ZK	4
Current state and development of modern power generation technologies. Modern coal power plants. Prediction of the inlet steam parameters (sub-or super-critical). Gas turbines in power generation. Combined steam and gas cycles in electricity and heat production. Modern steam boilers with supercritical steam parameters. Atmospheric fluidized bed combustion of coal. Pressurized combustion and gasification of coal. Modern technologies of coal utilisation. Advanced nuclear power reactors.			
2151082	Operation of Power Devices	Z,ZK	4
2151080	Control and Automation Engineering in Power Industry	Z,ZK	4
Fundamental terms of automatic control system in the power engineering. Means of automation control in the power engineering. Fundamental properties of control loops. Fundaments of the dynamic system theory. Structure of the power unit control system - safety appliance of the unit, automatic control of the power unit production. Dynamics of the steam-boilers, steam turbines and the power system. Stability control systems. The controlling of the performance and supplying of steam-boiler. Control of steam turbines. Control of power units and power systems.			
2151177	Thermal Insulation	Z,ZK	4
2152062	Turbocompressors and Fans	KZ	4
2122022	Special Parts of Pumping Technology	KZ	4
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. The content of the course assumes the knowledge of the previous course dealing with pumping technology. Students will get more detailed knowledge on pumps and pumping technology, in particular in the field of design and operation of the contemporary pumping facilities.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
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 comprehension 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 comprehension 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 comprehension 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 comprehension 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 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.			
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.			
2121041	Pumping Technology	Z,ZK	5
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. Students will gain knowledge on basic types of hydrostatic and hydrodynamic pumps, their construction and operational characteristics. Students will also get knowledge on the fundamentals of operation of pumps in hydraulic systems and more complex overview in selecting of type, construction and operation of pumps that are used in hydraulic systems.			
2121042	Hydrostatic Pumps and Transmission	Z,ZK	4
The course is considered for the students in the master study programme of Mechanical Engineering-Pumps and machinery facilities. Students will gain knowledge on basic types of hydrostatic pumps, construction and operation characteristics. The course will provide students with comprehensive overview in selecting type, construction and operation of hydraulic pumps. Students will also pass introduction to the fundamentals of hydrostatic and hydrodynamic transmissions, their characteristics, construction and applications.			
2122022	Special Parts of Pumping Technology	KZ	4
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. The content of the course assumes the knowledge of the previous course dealing with pumping technology. Students will get more detailed knowledge on pumps and pumping technology, in particular in the field of design and operation of the contemporary pumping facilities.			
2122041	Micro-hydro water turbines	KZ	2
The course is considered for the students in the master study programme of Mechanical Engineering, branch of study Power Engineering. Students will get knowledge on basic types of water turbines, their operational characteristics, construction and applications. The course will provide students with comprehensive overview in selecting type, construction and operation of micro-hydro water turbines.			
2151006	Nuclear Reactors and Steam Generators	Z,ZK	5
Problems with achievement of reactor criticality, principles of reactivity control. Fuels, moderators and structural materials for nuclear power reactors. Principal design characteristics of nuclear reactors, reactor kinetics and reactor radiation. Advanced reactors and steam generators.			
2151010	Combustion and Boilers	Z,ZK	5
2151021	District Heating	Z,ZK	5
2151026	Energy Sources and Conversions	Z,ZK	6
2151037	Steam and Gas Turbines	Z,ZK	5
Condensing, backpressure and extraction steam turbines. Basic principals of energy transformations in a turbine stage. Turbine stage with a short (one-dimensional approach) and long (three-dimensional effects) blade. Energy losses, polytropic and isentropic turbine efficiency. Thermodynamic analysis and design of a multi-stage steam and gas turbines. Power control of a steam and gas turbines. Off-design operation conditions of a steam and gas turbines.			
2151059	Advanced Power Generation Systems	Z,ZK	4
Current state and development of modern power generation technologies. Modern coal power plants. Prediction of the inlet steam parameters (sub- or super-critical). Gas turbines in power generation. Combined steam and gas cycles in electricity and heat production. Modern steam boilers with supercritical steam parameters. Atmospheric fluidized bed combustion of coal. Pressurized combustion and gasification of coal. Modern technologies of coal utilisation. Advanced nuclear power reactors.			
2151079	Thermal Cycles in Power Generation	Z,ZK	5
The lectures are focused on developing the knowledge required to analyse energy cycles performance (e.g. efficiency, power output, work and heat input) from cycle data. Steam Power (Rankine) Cycle: beginning with a simple cycle and adding more refinements (feedheating, economiser etc.). Application to electrical power generation where the heat source is supplied by: i) fossil fuel and ii) nuclear fuel. Gas Turbine (Brayton) Cycle: simple, then add intercooler, heat exchanger and reheater. The use of gas turbines for gas turbines to electrical power generation. Latest developments with concentrated solar energy as a heat source. Cooling towers. Hybrid systems: CHP, steam turbine with gas turbine. Exergy analysis of the energy cycles.			
2151080	Control and Automation Engineering in Power Industry	Z,ZK	4
Fundamental terms of automatic control system in the power engineering. Means of automation control in the power engineering. Fundamental properties of control loops. Fundamentals of the dynamic system theory. Structure of the power unit control system - safety appliance of the unit, automatic control of the power unit production. Dynamics of the steam-boilers, steam turbines and the power system. Stability control systems. The controlling of the performance and supplying of steam-boiler. Control of steam turbines. Control of power units and power systems.			
2151082	Operation of Power Devices	Z,ZK	4
2151084	Boiler Design	Z,ZK	5
Basic types of boilers, design variants. Fuel preparation before combustion - grinding and drying of solid fuels, energy balance. Influence of steam parameters and fuel properties on boiler design - influence of calorific value, influence of water, ash, volatile chlorine and nitrogen content. Methodology of new boiler design. Power plant boilers - sub and supercritical, fluidized bed boilers. Recent trends in boiler design - options for boiler efficiency improvement. Materials for boiler construction. Boiler slave equipment - transport lines, fans, precipitators.			

2151089	Industrial power engineering	Z,ZK	5
2151094	Biomass and Renewable Energy Sources The course comprises from 1/3 of general survey of various renewable energy sources (wind , hydro, solar and geothermal power) and the other 2/3 are dedicated to origin, types properties and energy coversion technologies of biomass.	Z,ZK	5
2151095	Nuclear Energy	Z,ZK	4
2151108	Thermal Hydraulics of Nuclear Reactors	Z,ZK	5
2151115	Design and Economy of Power Facilities	Z,ZK	5
2151137	Environmenatal Aspects of Energy Systems	Z,ZK	4
2151144	Introductory Cryogenics and Vacuum Technology	Z,ZK	5
2151153	Design and Operation of Cooling Equipments	Z,ZK	5
2151157	Principles of Refrigerating Technology and Heat Pumps	Z,ZK	5
2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4
2151170	Gaseous Fluids Compression and Delivery Theory of compression processes. Constructions, calculation, capacity control of compressors, operation with various gases. Refrigerating compressors. Accessories of a compressor stations and plants. Compressed air technology.Economical and ecological problems of a compressed air production and distribution.	Z,ZK	5
2151171	Compressors - selected Parts Selected parts of the theory, design and operation of positive displacement compressors (include refrigerating compressors). Non-ideal gas compression.	Z,ZK	4
2151177	Thermal Insulation	Z,ZK	4
2152022	Social aspects of power engineering	KZ	4
2152029	Energy Audit	KZ	4
2152045	Ecological Waste Treatment	KZ	4
2152062	Turbocompressors and Fans	KZ	4
2152064	Measurement in the Branch	KZ	4
2153051	Project I.	Z	5
2153052	Project II.	Z	5
2153053	Project III.	Z	10
2153998	Diploma Thesis	Z	10
2161004	Environmental engineering Application of a theory in environmental engineering	Z,ZK	6
2181136	Processing Equipments Design PEs classification, their parameters and criteria of their rating. Ways of PEs design according their purpose and utilization. Materials used for PEs, welding, corrosion mechanisms and anticorrosion prevention. Dimension of shafts, beams, supports, pipes, heat exchangers and pressure vessels. Sealing and packing of fix parts (flanges) and moving parts (rotating shafts etc.). Practical examples of proper and improper designs of apparatuses. Example of heat exchanger design (heat transfer area calculation, its arrangement, head loss calculation, thermal dilatation, strength calculation, low cycle fatigue (thermal dilatation)).	Z,ZK	6
2371519	Means of Automatic Control I. Various categories of means for automatic control according to the different criterions. Main features in each category.Air and hydraulic fluid as a medium for information transfer. Symbols and descriptions in pneumatic and hydraulic diagrams. Pneumatic control systems design. Pneumatic actuators, valves, special pneumatic, electropneumatic devices. Control valves, categories, dimensioning, design, applications. Intelligent pneumatics as an integration of pneumatic, electronic and control components and systems. Valve islands and terminals, standard, with industrial buses communication, programmable. Pneumatic positioning systems.	Z,ZK	6
2383062	Budget and Project Economic Assessment The goal of the course is to improve the knowledge gained within the basic bachelor's degree course Management and Economics of the Enterprise. The course focuses primarily on deepening of basic knowledge and skills in the creation and evaluation of the operational budget, proper preparation and evaluation of costing model for manufactured products and the economic evaluation of an investment project, as it corresponds to contemporary knowledge and the development of management methods and techniques. Students specify a simple fictional industrial or engineering company or its sub-section (preferably inspired by their practical experience, internships or training program in real company). The first student's task is to prepare a detailed plan and budget of a project (e.g. new product development, product or process innovation, etc.) focused on improvement of profitability, competitiveness or effectiveness of the company. The second task is cost calculation for chosen calculation unit. Last task within this course is the evaluation of economical effectiveness of the project described within the first task. The dynamic methods like Net Present Value (NPV), Internal Rate of Return (IRR) or Discounted Payback Period (DPP) are used for this evaluation. The quality of realization and presentation of the task's outputs together with the results of the test decides on granting / denial of credit.	Z	2

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

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