

Study plan

Name of study plan: 01 093 NSTI TZP 2012 základ

Faculty/Institute/Others:

Department: Department of Environmental Engineering

Branch of study guaranteed by the department: Environmental Engineering

Garantor of the study branch: prof. Ing. Jiří Bašta, Ph.D.

Program of study: Mechanical Engineering

Type of study: Follow-up master

Required credits: 120

Elective courses credits: 0

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 102

The role of the block: P

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

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

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) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2163011	Project 1 Pavel Vybíral	Z	5	0P+5C	*	P
2371519	Means of Automatic Control I.	Z,ZK	6	3P+2L	*	P
2161004	Environmental engineering Jiří Bašta Vladimír Zmrhal Jiří Bašta (Gar.)	Z,ZK	6	3P+2C	*	P
2151026	Energy Sources and Conversions	Z,ZK	6	3P+2C	*	P
2181136	Processing Equipments Design Lukáš Krátký, Jiří Moravec Lukáš Krátký Lukáš Krátký (Gar.)	Z,ZK	6	3P+2C	*	P

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

2163011	Project 1	Z	5	Project, dimensioning and designing solution of basic elements for heating, ventilation and air conditioning plants, devices for air pollution control, air feed and systems with recoverable source of heat.
2371519	Means of Automatic Control I.	Z,ZK	6	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.
2161004	Environmental engineering	Z,ZK	6	Application of a theory in environmental engineering
2151026	Energy Sources and Conversions	Z,ZK	6	
2181136	Processing Equipments Design	Z,ZK	6	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)).

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

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

Requirement credits in the group: In this group you have to gain 28 credits

Requirement courses in the group: In this group you have to complete 7 courses

Credits in the group: 28

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
2161083	Aerodynamics of Ventilation Martin Barták Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	P
2162076	Alternative Energy Sources	KZ	3	2P+1C	*	P
2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4	2P+1C	*	P
2161112	Air Pollution Control Jiří Hemerka, Pavel Vybíral Pavel Vybíral Jiří Hemerka (Gar.)	Z,ZK	4	2P+1C	*	P
2163012	Project II. Vladimír Zmrhal	Z	5	0P+5C	*	P
2161085	Heating	Z,ZK	4	2P+1C	*	P
2161086	Ventilation Vladimír Zmrhal	Z,ZK	4	2P+1C	*	P

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

2161083	Aerodynamics of Ventilation Application of fluid mechanics principles in heating, ventilation and air-conditioning. Solution tools for problems concerning air flow indoors or in ducts.	Z,ZK	4
2162076	Alternative Energy Sources Principles and basics of alternative energy sources applications. Solar energy. Heat pumps. Biomass utilization.	KZ	3
2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4
2161112	Air Pollution Control Fundamentals of the air pollution control with the accent to methods of particulate matter and gaseous pollutants removal and propagation of pollutants in the atmosphere.	Z,ZK	4
2163012	Project II. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	5
2161085	Heating Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.	Z,ZK	4
2161086	Ventilation Main knowledge for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity state and quality of air in residential and technological rooms.	Z,ZK	4

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

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

Requirement credits in the group: In this group you have to gain 22 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 22

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
2162070	Experimental Methods	KZ	5	1P+4L	*	P
2161079	Air-Conditioning František Drkal, Miloš Lain Miloš Lain František Drkal (Gar.)	Z,ZK	4	2P+1C	*	P
2163013	Project IV. Vladimír Zmrhal Vladimír Zmrhal (Gar.)	Z	5	0P+5C	*	P
2161051	Heat and Moisture Transfer in Environmental Engineering Martin Barták Martin Barták Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	P
2161102	Radiant and Industrial Heating Jiří Bašta, Jindřich Bohá Jiří Bašta Jiří Bašta (Gar.)	Z,ZK	4	2P+1C	*	P

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

2162070	Experimental Methods Develop knowledge and facility of measuring method in environmental engineering	KZ	5
2161079	Air-Conditioning Extend knowledge for design, control and evaluation of single-zone and multi-zone air conditioning systems.	Z,ZK	4
2163013	Project IV. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	5
2161051	Heat and Moisture Transfer in Environmental Engineering Application of heat and mass transfer in environmental engineering. Solution tools for tasks concerned with heat and moisture transfer.	Z,ZK	4
2161102	Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems	Z,ZK	4

Code of the group: 12NS*4P-TZP

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

Requirement credits in the group: In this group you have to gain 23 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 23

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
2163073	Hygiene and Physiology of Work <i>Jiří Bašta</i>	Z	2	1P+1C	*	P
2161087	Control of HVAC Systems	Z,ZK	4	2P+1C	*	P
2161039	Noise and Vibration Control	Z,ZK	4	2P+1C	*	P
2162056	Sanitary Installations <i>Roman Vavříka</i>	KZ	3	2P+1C	*	P

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

2163073	Hygiene and Physiology of Work The subject allow student to get knowledge about relations between human being and living (working) environment. It offers basic orientation in problematic of ergonomic load of living respectively working environment.	Z	2
2161087	Control of HVAC Systems Application of basic approaches to automatic control of HVAC systems and equipment. Automatic control sequences of air conditioning and sources of heat.	Z,ZK	4
2161039	Noise and Vibration Control Student will be informed about the basic methods of noise control and acoustic dimensions, which are important for evaluation of noise.	Z,ZK	4
2162056	Sanitary Installations Fundamentals for solving water-supply, gas and for waste draining by indoor building and by civil amenities building.	KZ	3

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 18

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, Zuzana Kalinová, Michaela Schusová, Veronika Kratochvílová Nina Procházková Ayyub</i>	Z	2	0P+2C	*	PV
2043083	French - Preparatory Course / FME <i>Eliška Vítková Eliška Vítková (Gar.)</i>	Z	2	0P+2C	*	PV
2043082	German - Preparatory Course / FME <i>Eliška Vítková Jaroslava Kormmová</i>	Z	2	0P+2C	*	PV
2043085	Russian - Preparatory Course / FME <i>Eliška Vítková, Hana Volejníková Eliška Vítková</i>	Z	2	0P+2C	*	PV
2043086	Czech - Preparatory Course <i>Petr Laurich Jaroslava Kormmová</i>	Z	2	0P+2C	*	PV
2043084	Spanish - Preparatory Course / FME <i>Eliška Vítková Jaime Andrés Villagómez</i>	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 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.	Z	2
2043083	French - Preparatory Course / FME 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.	Z	2
2043082	German - Preparatory Course / FME 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.	Z	2

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
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 Eva Pavlincová, Eliška Vítková, Ilona Šimice, Eva Kon elíková, Zuzana Kalinová, Michaela Schusová, Veronika Kratochvílová, Hana Volejníková, Nina Procházková Ayyub Nina Procházková Ayyub	ZK	1	0P+0C	*	PV
2041083	French - Master Exam / FME Eliška Vítková, Dušana Jirovská Eliška Vítková Eliška Vítková (Gar.)	ZK	1	0P+0C	*	PV
2041082	German - Master Exam / FME Eliška Vítková, Petr Laurich, Jaroslava Kommová Jaroslava Kommová	ZK	1	0P+0C	*	PV
2041085	Russian - Master Exam / FME Eliška Vítková, Dušana Jirovská, Hana Volejníková, Petr Zitko Eliška Vítková	ZK	1	0P+0C	*	PV
2041086	Czech- Master Exam Petr Laurich Jaroslava Kommová	ZK	1	0P+0C	*	PV
2041084	Spanish - Master Exam / FME Eliška Vítková, Jaime Andrés Villagómez Jaime Andrés Villagómez	ZK	1	0P+0C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12N**3Q--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.			
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.			
2041086	Czech- Master Exam	ZK	1
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-TZP

Name of the group: 2012 NSTI 2.sem 1povvol TZP

Requirement credits in the group: In this group you have to gain 3 credits

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

Credits in the group: 3

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
2162073	Filtration Pavel Vybíral	KZ	3	1P+1C	*	PV
E162017	Introduction to Building Performance Simulation	KZ	3	1P+1C	*	PV
2162067	District heating	KZ	3	1P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*2Q-TZP Name=2012 NSTI 2.sem 1povvol TZP

2162073	Filtration Theory of particle separation in the fibrous filter layer, classification and use of room air filters and HEPA filters. Industrial fabric filters - performance, filter media, use.	KZ	3
E162017	Introduction to Building Performance Simulation Overview and application of software tools in HVAC engineering.	KZ	3
2162067	District heating District heating with heat generators in heat-only and combined heat&power mode. Heat generators. Heating nets. Delivery stations.	KZ	3

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

Name of the group: 2012 NSTI 3.sem 2povvol TZP

Requirement credits in the group: In this group you have to gain 6 credits

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

Credits in the group: 6

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
E162016	Building and HVAC Systems Simulation Martin Barták	KZ	3	1P+1C	*	PV
2162055	Particle Separation Ji í Hemerka	KZ	3	1P+1C	*	PV
2162024	Industrial Ventilation František Drkal	KZ	3	1P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12NS*3Q-TZP Name=2012 NSTI 3.sem 2povvol TZP

E162016	Building and HVAC Systems Simulation Capita selecta of modeling and simulation in HVAC engineering with focus on air flow in buildings, solar heating technology and control of HVAC systems. This course follows up on E162009.	KZ	3
2162055	Particle Separation Fundamentals of the particle separation from flue gases and working knowledge for choice and dimensioning type of the separator.	KZ	3
2162024	Industrial Ventilation Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems.	KZ	3

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

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

Requirement credits in the group: In this group you have to gain 6 credits

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

Credits in the group: 6

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
2162102	Heating Surfaces Ji í Bašta	KZ	3	1P+1C	*	PV
2162101	Pneumatic Transport Ji í Hemerka	KZ	3	1P+1C	*	PV
2162104	Solar Thermal Engineering	KZ	3	1P+1C	*	PV
2162103	Fans	KZ	3	1P+1C	*	PV

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

2162102	Heating Surfaces Thermal-technical, geometric and operating characteristic of heating surfaces. Options and dimensioning of heating surfaces with respect to heating system and heated building (space).	KZ	3
2162101	Pneumatic Transport Theoretical fundamentals and calculation of the pipe pneumatic transport of granular materials. Working knowledge for choice and dimensioning type of the pneumatic transport.	KZ	3
2162104	Solar Thermal Engineering Subject Solar Thermal Engineering is focused on practical designing and evaluation of solar thermal systems, extending the knowledge gained in subjects on alternative energy sources	KZ	3
2162103	Fans Types of fans, Eulers equations for fans, criteria numbers of fans. Optimal parametrs of fans, pressure loss, efficiency of fans. Centrifugal flow fans, aerodynamics of fans, fan performance curve. Cross flow fan. Axial flow fans. Diffuser of axial fans. Control of fans. Fans in practices.	KZ	3

List of courses of this pass:

Code	Name of the course	Completion	Credits
2041081	English - Master Exam 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.	ZK	1
2041082	German - Master Exam / FME 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.	ZK	1
2041083	French - Master Exam / FME 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.	ZK	1
2041084	Spanish - Master Exam / FME 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.	ZK	1
2041085	Russian - Master Exam / FME 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.	ZK	1
2041086	Czech- Master Exam	ZK	1
2043081	English - Preparatory Course / FME 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.	Z	2
2043082	German - Preparatory Course / FME 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.	Z	2
2043083	French - Preparatory Course / FME 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.	Z	2
2043084	Spanish - Preparatory Course / FME 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.	Z	2
2043085	Russian - Preparatory Course / FME 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.	Z	2
2043086	Czech - Preparatory Course	Z	2
2151026	Energy Sources and Conversions	Z,ZK	6
2151164	Refrigeration Technique and Heat Pumps	Z,ZK	4
2161004	Environmental engineering Application of a theory in environmental engineering	Z,ZK	6
2161039	Noise and Vibration Control Student will be informed about the basic methods of noise control and acoustic dimensions, which are important for evaluation of noise.	Z,ZK	4
2161051	Heat and Moisture Transfer in Environmental Engineering Application of heat and mass transfer in environmental engineering. Solution tools for tasks concerned with heat and moisture transfer.	Z,ZK	4
2161079	Air-Conditioning Extend knowledge for design, control and evaluation of single-zone and multi-zone air conditioning systems.	Z,ZK	4
2161083	Aerodynamics of Ventilation Application of fluid mechanics principles in heating, ventilation and air-conditioning. Solution tools for problems concerning air flow indoors or in ducts.	Z,ZK	4
2161085	Heating Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.	Z,ZK	4
2161086	Ventilation Main knowledge for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity state and quality of air in residential and technological rooms.	Z,ZK	4
2161087	Control of HVAC Systems Application of basic approaches to automatic control of HVAC systems and equipment. Automatic control sequences of air conditioning and sources of heat.	Z,ZK	4
2161102	Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems	Z,ZK	4
2161112	Air Pollution Control Fundamentals of the air pollution control with the accent to methods of particulate matter and gaseous pollutants removal and propagation of pollutants in the atmosphere.	Z,ZK	4
2162024	Industrial Ventilation Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems.	KZ	3
2162055	Particle Separation Fundamentals of the particle separation from flue gases and working knowledge for choice and dimensioning type of the separator.	KZ	3
2162056	Sanitary Installations Fundamentals for solving water-supply, gas and for waste draining by indoor building and by civil amenities building.	KZ	3

2162067	District heating District heating with heat generators in heat-only and combined heat&power mode. Heat generators. Heating nets. Delivery stations.	KZ	3
2162070	Experimental Methods Develop knowledge and facility of measuring method in environmental engineering	KZ	5
2162073	Filtration Theory of particle separation in the fibrous filter layer, classification and use of room air filters and HEPA filters. Industrial fabric filters - performance, filter media, use.	KZ	3
2162076	Alternative Energy Sources Principles and basics of alternative energy sources applications. Solar energy. Heat pumps. Biomass utilization.	KZ	3
2162101	Pneumatic Transport Theoretical fundamentals and calculation of the pipe pneumatic transport of granular materials. Working knowledge for choice and dimensioning type of the pneumatic transport.	KZ	3
2162102	Heating Surfaces Thermal-technical, geometric and operating characteristic of heating surfaces. Options and dimensioning of heating surfaces with respect to heating system and heated building (space).	KZ	3
2162103	Fans Types of fans, Eulers equations for fans, criteria numbers of fans. Optimal parametrs of fans, pressure loss, efficiency of fans. Centrifugal flow fans, aerodynamics of fans, fan performance curve. Cross flow fan. Axial flow fans. Diffuser of axial fans. Control of fans. Fans in practices.	KZ	3
2162104	Solar Thermal Engineering Subject Solar Thermal Engineering is focused on practical designing and evaluation of solar thermal systems, extending the knowledge gained in subjects on alternative energy sources	KZ	3
2163011	Project 1 Project, dimensioning and designing solution of basic elements for heating, ventilation and air conditioning plants, devices for air pollution control, air feed and systems with recoverable source of heat.	Z	5
2163012	Project II. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	5
2163013	Project IV. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	5
2163073	Hygiene and Physiology of Work The subject allow student to get knowledge about relations between human being and living (working) environment. It offers basic orientation in problematic of ergonomic load of living respectively working environment.	Z	2
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
E162016	Building and HVAC Systems Simulation Capita selecta of modeling and simulation in HVAC engineering with focus on air flow in buildings, solar heating technology and control of HVAC systems. This course follows up on E162009.	KZ	3
E162017	Introduction to Building Performance Simulation Overview and application of software tools in HVAC engineering.	KZ	3

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

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