

# Study plan

**Name of study plan: Program Budovy a prost edí, obor B, zam ení Technická za ízení budov**

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Buildings and Environment

Type of study: Follow-up master full-time

Required credits: 90

Elective courses credits: 0

Sum of credits in the plan: 90

Note on the plan: tento studijní plán platí do nástupu do studia 2022/23

Name of the block: Compulsory courses

Minimal number of credits of the block: 28

The role of the block: Z

Code of the group: NB20170100

Name of the group: obor Budovy a prost edí, 1. semestr

Requirement credits in the group: In this group you have to gain at least 16 credits

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

Credits in the group: 16

Note on the group: doplněn 125SYB

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
101M04B	<b>Mathematics 4B</b> Petr Ku era, Zden k Skalák, Michal Beneš, Iva Malechová, Ivana Pultarová Petr Ku era Petr Ku era (Gar.)	Z,ZK	4	1P+2C	Z	z
102FYZB	<b>Thermomechanics</b> Vít zslav Vydra Vít zslav Vydra Vít zslav Vydra (Gar.)	Z	2	2P	Z	z
124DRS	<b>Timber Constructions</b> Milan Peukert, Kamil Stan k, Richard Hlavá , Jan Tywoniak, Jan R ži ka, Lukáš Velebil Jan Tywoniak Kamil Stan k (Gar.)	Z,ZK	3	2P+1C	L	z
124INB1	<b>Integrated Design of Buildings</b> Antonín Lupíšek, Petr Hájek, Martin Volf, Tereza Pavl Tereza Pavl Petr Hájek (Gar.)	Z,ZK	3	2P+1C	L	z
125SYB	<b>Building Systems</b> Jan Tywoniak, Karel Kabele Karel Kabele Karel Kabele (Gar.)	ZK	4	4P	Z	z

**Characteristics of the courses of this group of Study Plan: Code=NB20170100 Name=obor Budovy a prost edí, 1. semestr**

101M04B	Mathematics 4B <a href="https://mat.fsv.cvut.cz/kucera/">https://mat.fsv.cvut.cz/kucera/</a>	Z,ZK	4
102FYZB	Thermomechanics This course will concentrate on basic principles of transport of heat and mass (conduction, convection, radiation, heat pumps; transport of moist in building materials) with practical examples such as heat loss of a pipe, solar heating/cooling systems and heat loss thru a window (two plates of glass with a gas between). An excursion to a large solar-cooling installation with a solar-powered heat pump is a part of the course.	Z	2
124DRS	Timber Constructions Students will learn about the complex issues of designing modern wooden buildings. The introductory block of lectures is dedicated to the material base, structural systems, and mechanical properties of wood and wood-based materials. The principles of ensuring spatial rigidity of the light frame and mass-timber structural systems are presented. It follows a lecture block focused on the design of envelope constructions of wooden buildings, moisture safety, biological threats, and principles of wood protection. In the following two lectures, the structure of wood and the interaction of the wood substance with air humidity, which has a significant effect on all technical properties of wood, are described in more detail. The next lecture is devoted to passive measures to reduce the risk of summer overheating of wooden buildings. In the last lecture, construction technology is discussed and a comprehensive approach to the design of modern wooden buildings is emphasised.	Z,ZK	3
124INB1	Integrated Design of Buildings The main objective of the subject Integrated Building Design is to get an complex overview of the principles of integrated buildings design, life cycle assessment of buildings, evaluation of building performance, green/sustainable certification systems and understand environmental, social and economic aspects of the built environment.	Z,ZK	3

125SYB	Building Systems	ZK	4
Multi-criteria analysis of the requirements for the indoor environment and the function of the systems in different types of buildings and plants and optimization criteria for the design of energy and ecological building systems. Relationships between building technical equipment and the building. Integrated view of conceptual solutions in different building types in terms of indoor systems and building design. E.g. office buildings, residential buildings, halls, shopping centres, cultural centres, industrial buildings, sports buildings, family houses, passive etc. The audience will be introduced to the requirements for the indoor environment, the characteristic elements of energy and environmental building systems in relation to the structural design for the building type.			

Code of the group: NB20160200

Name of the group: obor Budovy a prost edí, 2. semestr

Requirement credits in the group: In this group you have to gain at least 12 credits

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

Credits in the group: 12

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
124ST2B	<b>Thermal Engineering in Construction 2</b> Zbyn k Svoboda, Pavel Kopecký Zbyn k Svoboda Zbyn k Svoboda (Gar.)	Z	2	1P+1C	L	z
125EAB1	<b>Energy audit 1</b> Karel Kabele, Michal Kabrhel, Miroslav Urban Karel Kabele Karel Kabele (Gar.)	KZ	3	2P+1C	L	z
125MEBU	<b>Building energy performance modelling</b> Karel Kabele, Miroslav Urban Karel Kabele Karel Kabele (Gar.)	KZ	3	1P+2C	L	z
125VKB	<b>Ventilation and Air conditioning of Buildings</b> Daniel Adamovský Daniel Adamovský Daniel Adamovský (Gar.)	Z,ZK	4	2P+1C	L	z

Characteristics of the courses of this group of Study Plan: Code=NB20160200 Name=obor Budovy a prost edí, 2. semestr

124ST2B	Thermal Engineering in Construction 2	Z	2
Improvement of knowledge from the basic building physics course. Detailed analysis of boundary conditions for calculations, governing equations of heat and water vapor transfer (diffusion, convection), thermal transmittance of windows and curtain walling, CFD, ventilated double-skin constructions, energy performance of buildings in detail, thermal protection of historical buildings.			
125EAB1	Energy audit 1	KZ	3
Advanced course for introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance directive for buildings. Methodology of calculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition, description of initial condition object survey and survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy consumption - building, heating, lighting, ventilating systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluation, evaluation from the aspect of environment protection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is focused on the realistic buildings resulting to presenting case study report about energy audit of existing building.			
125MEBU	Building energy performance modelling	KZ	3
The course is aimed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of tools and methodologies for solving these problems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construction and other factors affecting building behaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating building energy behaviour.			
125VKB	Ventilation and Air conditioning of Buildings	Z,ZK	4
An advanced course in ventilation and air conditioning focused on deepening the core topics in the field of ventilation of specific facilities, basics of fire and smoke ventilation, air-conditioning and cooling.			

Name of the block: Povinné p edm ty zam ení

Minimal number of credits of the block: 26

The role of the block: PZ

Code of the group: NB20170201

Name of the group: obor B, zam ení Technická za ízení, p edm ty zam ení

Requirement credits in the group: In this group you have to gain at least 26 credits

Requirement courses in the group: In this group you have to complete at least 6 courses

Credits in the group: 26

Note on the group:

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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
125EBU	<b>Electrotechnics and intelligent buildings</b> Bohumír Garlík Bohumír Garlík Bohumír Garlík (Gar.)	ZK	3	2P	Z	PZ
125SPB1	<b>Specialized design project 1</b> Stanislav Frolík Stanislav Frolík (Gar.)	KZ	4	3C	Z	PZ

125VPVA	<b>Indoor environmental quality and space heating A</b> <i>Karel Kabele, Michal Kabrhel, Zuzana Veverková, Pavla Dvořáková, Hana Kabrhelová</i> <b>Hana Kabrhelová</b> Karel Kabele (Gar.)	ZK	7	4P+2C	Z	PZ
125LTZB	<b>Laboratory of Building Services Systems</b> <i>Michal Kabrhel</i> Michal Kabrhel (Gar.)	Z	2	2C	L	PZ
125SPB2	<b>Specialized design project 2</b> <i>Karel Kabele, Michal Kabrhel, Miroslav Urban, Zuzana Veverková, Daniel Adamovský, Pavla Dvořáková, Bohumír Garlík, Hana Kabrhelová, Stanislav Frolík, ....</i> <b>Stanislav Frolík</b> Stanislav Frolík (Gar.)	KZ	5	4C	L	PZ
125ZTTB	<b>Sanitary and technological equipment and installations</b> <i>Stanislav Frolík, Ilona Koubková</i> <b>Stanislav Frolík</b> Stanislav Frolík (Gar.)	ZK	5	4P	L	PZ

**Characteristics of the courses of this group of Study Plan: Code=NB20170201 Name=obor B, zaměření Technická zařízení, podmínky zaměření**

125EBU	Electrotechnics and intelligent buildings	ZK	3
The information society, intelligent systems, new technologies significantly influence various HVAC system applications. The fundamental idea is to save energy, materials and ensure optimal indoor and outdoor environmental parameters. The influence of electromagnetic environment, electromagnetic compatibility, application of intelligent devices in buildings requires a system approach to solve the whole complex of HVAC and intelligent wiring.			
125SPB1	Specialized design project 1	KZ	4
Design project is an independent subject for the students of Master degree study programme of Buildings and Environment. Students should prove deeper knowledge concerning the problem of building services systems.			
125VPVA	Indoor environmental quality and space heating A	ZK	7
A course on technical building facilities focusing on a comprehensive view of the quality of the indoor environment in terms of its impact on health, work productivity, energy performance and the environment. An in-depth section focusing on the analysis and design of building energy systems that provide for the generation, transformation and distribution of energy in buildings to ensure thermal comfort in winter and an optimal indoor environment with minimal environmental impact. Practical application of the topics is carried out in the seminars.			
125LTZB	Laboratory of Building Services Systems	Z	2
The course focuses on practical work in the field of building services systems. In the course measuring devices parameters will be explained and practical problems will be solved.			
125SPB2	Specialized design project 2	KZ	5
Design project is an independent subject for the students of Master degree study programme of Buildings and Environment. Students should prove deeper knowledge concerning the problem of building services systems.			
125ZTTB	Sanitary and technological equipment and installations	ZK	5
Principles of environmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system design, pumping devices, water saving and special installations. The field of technological equipment of buildings deals with the issues of saunas and fireplaces, elevator technology, kitchens for communal meals, heat pumps, swimming pool technologies, gas boiler rooms in residential and civic buildings. As part of the subject, excursions are made to selected objects related to the subject being taught.			

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 6

The role of the block: S

Code of the group: NB20160201\_1

Name of the group: obor B, zaměření Technická zařízení, povinně volitelné podmínky

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

Requirement courses in the group: In this group you have to complete at least 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
124YBM1	<b>Building Information Modeling (BIM) for Building Structures 1</b> <i>Hana Kabrhelová, Stanislav Frolík, Pavel Chour, Renáta Hořáková, Jakub Veselka, Petr Matějka, Petr Pánek, Kateřina Šenfeld</i> <b>Jan Růžička</b> Jan Růžička (Gar.)	Z	4	1P+3C	Z	s
124YKSD	<b>Complex Structural Detail</b> <i>Jiří Pazderka, Radek Zigler</i> <b>Jiří Pazderka</b> Jiří Pazderka (Gar.)	Z	2	1P+1C	Z	s
124YPZB	<b>Fire Prevention and Healthy Buildings</b> <i>Vladimír Můzer, Marek Pokorný</i> <b>Marek Pokorný</b> Vladimír Můzer (Gar.)	Z	2	2P		s
125YATM	<b>Applied Thermomechanics</b> <i>Daniel Adamovský</i> <b>Daniel Adamovský</b> Daniel Adamovský (Gar.)	Z	2	1P+1C	Z	s
125YOPZ	<b>Gas services systems</b> <i>Ilona Koubková</i> <b>Ilona Koubková</b> Ilona Koubková (Gar.)	Z	2	1P+1C	L	s
125YOZE	<b>Renewable Energy Sources</b> <i>Michal Kabrhel</i> <b>Michal Kabrhel</b> Michal Kabrhel (Gar.)	Z	2	2P	L	s
125YUOB	<b>Artificial illumination</b> <i>Pavla Dvořáková, Bohumír Garlík</i> <b>Pavla Dvořáková</b> Pavla Dvořáková (Gar.)	Z	2	1P+1C	L	s
143APE	<b>Applied Ecology</b> <i>Tomáš Dostál</i> <b>Tomáš Dostál</b> Tomáš Dostál (Gar.)	Z	2	2P	L	s

**Characteristics of the courses of this group of Study Plan: Code=NB20160201\_1 Name=obor B, zaměření Technická zařízení, povinně volitelné podmínky**

124YBM1	Building Information Modeling (BIM) for Building Structures 1	Z	4
Building information model (BIM) - basic principles of creating a building information model in the field of civil engineering, specifics of BIM modeling. The subject uses the Autodesk Revit software base. Building information model in the life cycle of the building - information required during the design part, during construction and during use of the finished building.			
124YKSD	Complex Structural Detail	Z	2
The aim of the course is to extend the knowledge gained in previous courses - it is intended for students who have already reached advanced level of knowledge about structural problems in buildings. The content of the course is focused on the complex solution of construction details, following all legislative requirements and taking into account the maximum efficiency and durability of the chosen solution.			
124YPZB	Fire Prevention and Healthy Buildings	Z	2
The subject is focused on the presentation of the basic concepts and principles of fire safety of buildings and health safety of buildings. It is intended for students of non-fire disciplines and should enable them to consider aspects of fire safety and health safety from the initial stages of project preparation of buildings.			
125YATM	Applied Thermomechanics	Z	2
The course Applied thermocheanics contains three basic groups, in which the student is gradually introduced to selected chapters on moist air, vapour thermodynamics and heat sharing. The aim of each chapter is to introduce students to the principles of equipment common in heating, ventilation and cooling systems that they will encounter in practice. The chapter on humid air will discuss typical and lesser used processes occurring in air handling units. The vapor thermodynamics section focuses on the familiar compressor and absorption chillers and heat pumps. The final chapter will explain the processes and principles related to heat exchangers.			
125YOPZ	Gas services systems	Z	2
Gas connections - draft, addressing gas in the building, including design and assessment of gas appliances, pipe sizing and pressure loss dimensioning pipe examination rooms in terms of the amount of air for combustion, alternative solutions for propane-butane.			
125YOZE	Renewable Energy Sources	Z	2
The course deals with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hydro-are discussed in detail. The characteristics of the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design facilities and systems that use renewable energy sources.			
125YUOB	Artificial illumination	Z	2
The course provides a basic introduction to artificial lighting. Lighting technical quantities and related calculations are included. The theoretical principles of indoor lighting and lighting systems are discussed with application to various types of buildings and plants. Students are introduced to an overview of light sources and luminaires and their characteristics. Power, control and management and maintenance of lighting systems are also discussed along with energy consumption. There is also basic information on emergency lighting and outdoor lighting. Excursions are also part of the teaching. During the tutorials, a lighting project (plus electrical) is designed for a given space using the DIALux evo software.			
143APE	Applied Ecology	Z	2
Learning basic of ecological terminology, landscape ecology and ecological stability. Energy flow in the different ecosystems.			

Name of the block: Povinn volitelné p edm ty, doporu ení S2

Minimal number of credits of the block: 30

The role of the block: S2

Code of the group: NB20160301

Name of the group: obor B, zam ení Technická za ízení, diplomová práce

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 at least 1 course

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
125DPM	Diploma Thesis <i>Stanislav Frolík Stanislav Frolík (Gar.)</i>	Z	30	24C	Z	S2

Characteristics of the courses of this group of Study Plan: Code=NB20160301 Name=obor B, zam ení Technická za ízení, diplomová práce

125DPM	Diploma Thesis	Z	30
Diploma thesis is an independent project of a student at the end of Master degree study programme at the Faculty of Civil Engineering. Diploma thesis consists of two sections, a diploma thesis seminar and the actual thesis. In the diploma seminar section, the student works with the data and background information relating to the topic of the thesis. The student consults the supervisor.			

### List of courses of this pass:

Code	Name of the course	Completion	Credits
101M04B	Mathematics 4B <a href="https://mat.fsv.cvut.cz/kucera/">https://mat.fsv.cvut.cz/kucera/</a>	Z,ZK	4
102FYZB	Thermomechanics	Z	2
This course will concentrate on basic principles of transport of heat and mass (conduction, convection, radiation, heat pumps; transport of moist in building materials) with practical examples such as heat loss of a pipe, solar heating/cooling systems and heat loss thru a window (two plates of glass with a gas between). An excursion to a large solar-cooling installation with a solar-powered heat pump is a part of the course.			

<b>124DRS</b>	<b>Timber Constructions</b>	<b>Z,ZK</b>	<b>3</b>
Students will learn about the complex issues of designing modern wooden buildings. The introductory block of lectures is dedicated to the material base, structural systems, and mechanical properties of wood and wood-based materials. The principles of ensuring spatial rigidity of the light frame and mass-timber structural systems are presented. It follows a lecture block focused on the design of envelope constructions of wooden buildings, moisture safety, biological threats, and principles of wood protection. In the following two lectures, the structure of wood and the interaction of the wood substance with air humidity, which has a significant effect on all technical properties of wood, are described in more detail. The next lecture is devoted to passive measures to reduce the risk of summer overheating of wooden buildings. In the last lecture, construction technology is discussed and a comprehensive approach to the design of modern wooden buildings is emphasised.			
<b>124INB1</b>	<b>Integrated Design of Buildings</b>	<b>Z,ZK</b>	<b>3</b>
The main objective of the subject Integrated Building Design is to get an complex overview of the principles of integrated buildings design, life cycle assessment of buildings, evaluation of building performance, green/sustainable certification systems and understand environmental, social and economic aspects of the built environment.			
<b>124ST2B</b>	<b>Thermal Engineering in Construction 2</b>	<b>Z</b>	<b>2</b>
Improvement of knowledge from the basic building physics course. Detailed analysis of boundary conditions for calculations, governing equations of heat and water vapor transfer (diffusion, convection), thermal transmittance of windows and curtain walling, CFD, ventilated double-skin constructions, energy performance of buildings in detail, thermal protection of historical buildings.			
<b>124YBM1</b>	<b>Building Information Modeling (BIM) for Building Structures 1</b>	<b>Z</b>	<b>4</b>
Building information model (BIM) - basic principles of creating a building information model in the field of civil engineering, specifics of BIM modeling. The subject uses the Autodesk Revit software base. Building information model in the life cycle of the building - information required during the design part, during construction and during use of the finished building.			
<b>124YKSD</b>	<b>Complex Structural Detail</b>	<b>Z</b>	<b>2</b>
The aim of the course is to extend the knowledge gained in previous courses - it is intended for students who have already reached advanced level of knowledge about structural problems in buildings. The content of the course is focused on the complex solution of construction details, following all legislative requirements and taking into account the maximum efficiency and durability of the chosen solution.			
<b>124YPZB</b>	<b>Fire Prevention and Healthy Buildings</b>	<b>Z</b>	<b>2</b>
The subject is focused on the presentation of the basic concepts and principles of fire safety of buildings and health safety of buildings. It is intended for students of non-fire disciplines and should enable them to consider aspects of fire safety and health safety from the initial stages of project preparation of buildings.			
<b>125DPM</b>	<b>Diploma Thesis</b>	<b>Z</b>	<b>30</b>
Diploma thesis is an independent project of a student at the end of Master degree study programme at the Faculty of Civil Engineering. Diploma thesis consists of two sections, a diploma thesis seminar and the actual thesis. In the diploma seminar section, the student works with the data and background information relating to the topic of the thesis. The student consults the supervisor.			
<b>125EAB1</b>	<b>Energy audit 1</b>	<b>KZ</b>	<b>3</b>
Advanced course for introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance directive for buildings. Methodology of calculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition, description of initial condition object survey and survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy consumption - building, heating, lighting, ventilating systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluation, evaluation from the aspect of environment protection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is focused on the realistic buildings resulting to presenting case study report about energy audit of existing building.			
<b>125EBU</b>	<b>Electrotechnics and intelligent buildings</b>	<b>ZK</b>	<b>3</b>
The information society, intelligent systems, new technologies significantly influence various HVAC system applications. The fundamental idea is to save energy, materials and ensure optimal indoor and outdoor environmental parameters. The influence of electromagnetic environment, electromagnetic compatibility, application of intelligent devices in buildings requires a system approach to solve the whole complex of HVAC and intelligent wiring.			
<b>125LTZB</b>	<b>Laboratory of Building Services Systems</b>	<b>Z</b>	<b>2</b>
The course focuses on practical work in the field of building services systems. In the course measuring devices parameters will be explained and practical problems will be solved.			
<b>125MEBU</b>	<b>Building energy performance modelling</b>	<b>KZ</b>	<b>3</b>
The course is aimed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of tools and methodologies for solving these problems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construction and other factors affecting building behaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating building energy behaviour.			
<b>125SPB1</b>	<b>Specialized design project 1</b>	<b>KZ</b>	<b>4</b>
Design project is an independent subject for the students of Master degree study programme of Buildings and Environment. Students should prove deeper knowledge concerning the problem of building services systems.			
<b>125SPB2</b>	<b>Specialized design project 2</b>	<b>KZ</b>	<b>5</b>
Design project is an independent subject for the students of Master degree study programme of Buildings and Environment. Students should prove deeper knowledge concerning the problem of building services systems.			
<b>125SYB</b>	<b>Building Systems</b>	<b>ZK</b>	<b>4</b>
Multi-criteria analysis of the requirements for the indoor environment and the function of the systems in different types of buildings and plants and optimization criteria for the design of energy and ecological building systems. Relationships between building technical equipment and the building. Integrated view of conceptual solutions in different building types in terms of indoor systems and building design. E.g. office buildings, residential buildings, halls, shopping centres, cultural centres, industrial buildings, sports buildings, family houses, passive etc. The audience will be introduced to the requirements for the indoor environment, the characteristic elements of energy and environmental building systems in relation to the structural design for the building type.			
<b>125VKB</b>	<b>Ventilation and Air conditioning of Buildings</b>	<b>Z,ZK</b>	<b>4</b>
An advanced course in ventilation and air conditioning focused on deepening the core topics in the field of ventilation of specific facilities, basics of fire and smoke ventilation, air-conditioning and cooling.			
<b>125VPVA</b>	<b>Indoor environmental quality and space heating A</b>	<b>ZK</b>	<b>7</b>
A course on technical building facilities focusing on a comprehensive view of the quality of the indoor environment in terms of its impact on health, work productivity, energy performance and the environment. An in-depth section focusing on the analysis and design of building energy systems that provide for the generation, transformation and distribution of energy in buildings to ensure thermal comfort in winter and an optimal indoor environment with minimal environmental impact. Practical application of the topics is carried out in the seminars.			
<b>125YATM</b>	<b>Applied Thermomechanics</b>	<b>Z</b>	<b>2</b>
The course Applied thermocheanics contains three basic groups, in which the student is gradually introduced to selected chapters on moist air, vapour thermodynamics and heat sharing. The aim of each chapter is to introduce students to the principles of equipment common in heating, ventilation and cooling systems that they will encounter in practice. The chapter on humid air will discuss typical and lesser used processes occurring in air handling units. The vapor thermodynamics section focuses on the familiar compressor and absorption chillers and heat pumps. The final chapter will explain the processes and principles related to heat exchangers.			
<b>125YOPZ</b>	<b>Gas services systems</b>	<b>Z</b>	<b>2</b>
Gas connections - draft, addressing gas in the building, including design and assessment of gas appliances, pipe sizing and pressure loss dimensioning pipe examination rooms in terms of the amount of air for combustion, alternative solutions for propane-butane.			

125YOZE	Renewable Energy Sources	Z	2
The course deals with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hydro-are discussed in detail. The characteristics of the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design facilities and systems that use renewable energy sources.			
125YUOB	Artificial illumination	Z	2
The course provides a basic introduction to artificial lighting. Lighting technical quantities and related calculations are included. The theoretical principles of indoor lighting and lighting systems are discussed with application to various types of buildings and plants. Students are introduced to an overview of light sources and luminaires and their characteristics. Power, control and management and maintenance of lighting systems are also discussed along with energy consumption. There is also basic information on emergency lighting and outdoor lighting. Excursions are also part of the teaching. During the tutorials, a lighting project (plus electrical) is designed for a given space using the DIALux evo software.			
125ZTTB	Sanitary and technological equipment and installations	ZK	5
Principles of environmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system design, pumping devices, water saving and special installations. The field of technological equipment of buildings deals with the issues of saunas and fireplaces, elevator technology, kitchens for communal meals, heat pumps, swimming pool technologies, gas boiler rooms in residential and civic buildings. As part of the subject, excursions are made to selected objects related to the subject being taught.			
143APE	Applied Ecology	Z	2
Learning basic of ecological terminology, landscape ecology and ecological stability. Energy flow in the different ecosystems.			

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

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