Study plan

Name of study plan: Inteligentní budovy

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Intelligent Buildings Type of study: Follow-up master full-time

Required credits: 120 Elective courses credits: 0 Sum of credits in the plan: 120

Note on the plan: tento studijní plán platí od nástupu 2020

Name of the block: Compulsory courses Minimal number of credits of the block: 88

The role of the block: Z

Code of the group: NX202001

Name of the group: Inteligentní budovy, 1. semestr

Requirement credits in the group: In this group you have to gain at least 14 credits

Requirement courses in the group: In this group you have to complete at least 3 courses

Credits in the group: 14 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
124ST1	Thermal Engineering in Construction 1 Jan Tywoniak Jan Tywoniak (Gar.)	ZK	5	2P	Z	Z
124OSIB	Lighting and Acoustics Jaroslav Vychytil, Lenka Maierová Jaroslav Vychytil Jaroslav Vychytil (Gar.)	KZ	4	2P	Z	Z
A5M14RPI	Distribution of Electric Energy and Drives Ji í Lettl, Pavel Mindl, Jan Bauer Ji í Lettl Ji í Lettl (Gar.)	Z,ZK	5	2P+1L	Z	Z

Characteristics of the courses of this group of Study Plan: Code=NX202001 Name=Inteligentní budovy, 1. semestr

124ST1	Thermal Engineering in Construction 1	ZK	5
The subject discusses t	ne basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of prov	iding basic inform	ation to students
coming from non-constr	ruction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from	civil engineering.	
124OSIB	Lighting and Acoustics	KZ	4
The course introduces s	students to the basics of building lighting technology and building acoustics and deepens further knowledge.		
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5

Code of the group: NX202002

Name of the group: Inteligentní budovy, 2. semestr

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 4 courses

Credits in the group: 26

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
125PIB1	Project 1 Zuzana Veverková, Ilona Koubková, Michal Kabrhel, Karel Kabele, Stanislav Frolík, Bohumír Garlík, Daniel Adamovský, Miroslav Urban, Pavla Hofbauer Pechová, Stanislav Frolík Michal Kabrhel (Gar.)	Z	6	4C	L	Z
125EABU	Energy Audit of Building Michal Kabrhel, Karel Kabele, Miroslav Urban Karel Kabele Karel Kabele (Gar.)	KZ	4	2P+1C	L	Z

125ESB	Buildings Ecology Systems Stanislav Frolík Stanislav Frolík (Gar.)	KZ	4	2P	L	Z
2161109	Automatic control in environmental engineering of building Ji í Bašta, Jind ich Bohá Ji í Bašta Ji í Bašta (Gar.)	Z,ZK	4	2P+1C	*	Z
2161567	Ventilation and Air Conditioning Vladimír Zmrhal, Miloš Lain Vladimír Zmrhal Vladimír Zmrhal (Gar.)	Z,ZK	4	2P+1C	2	Z
A5M38SZS	Sensors and Networks Pavel Rinka, Antonin Platil, Pavel Rinka (Gar.)	Z,ZK	4	2P+1L	L	Z

Characteristics of the courses of this group of Study Plan: Code=NX202002 Name=Inteligentní budovy, 2. semestr

125PIB1	Project 1	Z	6
Project 1 is the sub	ect of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the known	, wledge from the B	achelor's degree
to other disciplines	In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a t	thorough analysis	of the current
state of the art fron	the literature.		
125EABU	Energy Audit of Building	KZ	4
Advanced course for	or introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance of buildings, legislation.	performance direc	tive for buildings
Methodology of cal	culating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial cond	lition, description o	of initial condition
object survey and s	urvey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energ	gy consumption - I	building, heating
lighting, ventilating	systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical eva	lluation, evaluation	n from the aspec
of environment pro-	ection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar i	is focused on the i	realistic buildings
	in a constant of the constant		
resulting to presen	ing case study report about energy audit of existing building.		
125ESB	Buildings Ecology Systems	KZ	4
125ESB			1 -
125ESB	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, systems		1
125ESB Principles of enviro	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, systems		1 -
125ESB Principles of enviro saving and special 2161109	Buildings Ecology Systems mentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system installations.	z,ZK	ng devices, water
125ESB Principles of enviro saving and special 2161109	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system installations. Automatic control in environmental engineering of building	z,ZK	ng devices, wate
125ESB Principles of enviro saving and special 2161109 Application of basic 2161567	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, systems installations. Automatic control in environmental engineering of building approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and source	Z,ZK es of heat.	d devices, water
125ESB Principles of enviro saving and special 2161109 Application of basic 2161567 Main knowledge fo	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, systems installations. Automatic control in environmental engineering of building approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and source Ventilation and Air Conditioning	Z,ZK es of heat.	d devices, water
125ESB Principles of enviro saving and special 2161109 Application of basic 2161567 Main knowledge fo	Buildings Ecology Systems nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, systems installations. Automatic control in environmental engineering of building approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and source Ventilation and Air Conditioning design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of therma	Z,ZK es of heat.	d devices, wate

Code of the group: NX202003

Name of the group: Inteligentní budovy, 3. semestr

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

Requirement courses in the group: In this group you have to complete at least 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
125PIB2	Project 2 Michal Kabrhel Michal Kabrhel (Gar.)	Z	6	4C	Z	Z
2161102	Radiant and Industrial Heating Ji í Bašta, Jind ich Bohá Ji í Bašta Ji í Bašta (Gar.)	Z,ZK	4	2P+1C	*	Z
B5M99SCT	Technology for Smart Cities Lukáš Ferkl Lukáš Ferkl Lukáš Ferkl (Gar.)	Z,ZK	4	2P+1C	Z	Z
125TECE	Technological Units Ilona Koubková Ilona Koubková (Gar.)	KZ	4	2P	Z	Z
125SYB	Building Systems Jan Tywoniak, Karel Kabele Karel Kabele (Gar.)	ZK	4	4P	Z	Z

Characteristics of the courses of this group of Study Plan: Code=NX202003 Name=Inteligentní budovy, 3. semestr

125PIB2	Project 2	Z	6
Project 2 is the subject	of the interfaculty discipline Intelligent Buildings. In the project, the student demonstrates the ability to independently develop	a more advance	d project in the
field of intelligent buildir	ngs.		
2161102	Radiant and Industrial Heating	Z,ZK	4
Student will be informed	d about the basics of radiant and other industrial heating systems		•
B5M99SCT	Technology for Smart Cities	Z,ZK	4
125TECE	Technological Units	KZ	4
Saunas, fireplaces, kitc	hen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.		
125SYB	Building Systems	ZK	4
1			

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: NX202004

Name of the group: Inteligentní budovy, 4. semestr

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 1 course

Credits in the group: 26

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
125DPIB	Diploma Thesis Michal Kabrhel Michal Kabrhel (Gar.)	Z	26	20C	L	Z

Characteristics of the courses of this group of Study Plan: Code=NX202004 Name=Inteligentní budovy, 4. semestr

125DPIB Diploma Thesis

| Z | 26

Thesis of students studying the Master's degree programme Intelligent Buildings. Independent final thesis usually in the form of a complex project, theoretical work or a combination of the previous forms.

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 32

The role of the block: PV

Code of the group: NX2020_1

Name of the group: Inteligentní budovy, povinn volitelné p edm ty

Requirement credits in the group: In this group you have to gain at least 32 credits

Requirement courses in the group: In this group you have to complete at least 8 courses

Credits in the group: 32 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
124KPKP	Building Structures - Final Review Ctislav Fiala Ctislav Fiala (Gar.)	ZK	4	3P	Z	PV
125OZEB	Renewable Energy Sources Michal Kabrhel, Hana Kabrhelová Michal Kabrhel (Gar.)	ZK	4	2P	L	PV
124INBB	Integrated Design of Buildings Petr Hájek, Antonín Lupíšek Antonín Lupíšek Petr Hájek (Gar.)	Z,ZK	4	2P+1C	Z	PV
125EIBB	Electroengineering and intelligent buildings Bohumír Garlík Bohumír Garlík (Gar.)	KZ	4	2P	Z	PV
2161108	Transport Phenomena Martin Barták Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	PV
2162113	Heating Ji í Bašta, Jind ich Bohá , Roman Vav i ka Ji í Bašta Ji í Bašta (Gar.)	KZ	4	2P+2C	1	PV
A5M15ES1	Electrical Light 1 Petr Žák, Petr Žák	KZ	4	2P+1S	Z	PV
A5M38MEB	Measurements in the Buildings Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)	KZ	4	2P+1L	Z	PV
2162035	Alternative Energy Sources Tomáš Matuška Tomáš Matuška (Gar.)	KZ	4	2P+1C	*	PV
2151154	Refrigertion and heat pumps	KZ	4	3P+1C		PV
2162019	Industrial Heating, Ventilation, Airconditioning Vladimír Zmrhal, Miloš Lain Vladimír Zmrhal Vladimír Zmrhal (Gar.)	KZ	4	2P+1C	2	PV
A5M34ELE	Electronics Alexandr Laposa Alexandr Laposa (Gar.)	KZ	4	3P+1L	L	PV
A5M38SBD	Collection and Data Transfer Pavel Mlejnek Pavel Mlejnek Ji í Novák (Gar.)	KZ	4	2P+1L	L	PV
125PBZB	Fire Services Ilona Koubková, Bohumír Garlík, Pavla Hofbauer Pechová Ilona Koubková Ilona Koubková (Gar.)	KZ	4	2P	L	PV
125MEC	Simulation of Building Energy Performance Karel Kabele, Miroslav Urban Karel Kabele Karel Kabele (Gar.)	KZ	4	1P+1C	Z	PV
2162700	Experimental Methods 1 Miroslav Ku era Miroslav Ku era (Gar.)	KZ	4	0P+4L	*	PV
2162064	Noise and Vibration Control Miroslav Ku era, Richard Nový Miroslav Ku era Miroslav Ku era (Gar.)	KZ	4	2P+1C	*	PV
2162066	Heat Supply Tomáš Matuška Tomáš Matuška (Gar.)	KZ	4	2P+1C	3	PV

A5M34EZS	Electronic security systems Miroslav Husák, Jan Novák, Tomáš Teplý Miroslav Husák (Gar.)	KZ	4	3P+1L	Z	PV
A5M13NZZ	Independent sources Václav Papež Václav Papež Václav Papež (Gar.)	KZ	4	3P+1L	Z	PV
A5M13FVS	Photovoltaic Systems Pavel Hrzina, Ladislava erná, Vít zslav Benda Ladislava erná Pavel Hrzina (Gar.)	KZ	4	2P+2L	Z	PV
A5M16EUE	Economics of Energy Use Ji í Beranovský Ji í Beranovský (Gar.)	KZ	4	3P+1C	Z	PV
A5M16FIP	Corporate finance Old ich Starý, Ji í Vaší ek, Blanka Ku erková Ji í Vaší ek Old ich Starý (Gar.)	KZ	4	3P+1C	L	PV

124KPKP Building Structures - Final Review ZK 4 Basics of building structures. Functional requirements, structural systems, spatial effect of the structural system. Vertical load-bearing structures, floor structures, overhanging structures. Envelopes of buildings, windows, partitions, floors, suspended ceilings. Stairs, roof construction - timber roof trusses, roof envelopes. Foundation structures, structural solution of the substructure, waterproofing of the substructure. Structural systems of single and multi-storey buildings, structural systems of long-span structures ZK 12507FB Renewable Energy Sources 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 Integrated Design of Buildings Z.ZK **124INBB** 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. Electroengineering and intelligent buildings 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. 2161108 Z,ZK Transport Phenomena 4 Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment. 2162113 ΚZ 4 Heating Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems. ΚZ A5M15ES1 Electrical Light 1 4 A5M38MEB Measurements in the Buildings ΚZ The students will learn about principles of measurement of basic physical quantities in the building. As the majority of the physical quantities are converted to the electrical signals, an overview of measurement of the electrical quantities is also presented. The subject is not intended for students who have already studied the subjects Electrical measurement and Sensors and transducers on CTU FEE. 2162035 ΚZ Alternative Energy Sources 4 Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization Refrigertion and heat pumps ΚZ 4 2151154 The subject is an introduction to the refrigeration technology and the heat pumps with the following thematic areas: • Fundamentals of thermodynamics. Classification of cycles. • Single-stage vapour cycle: basic form, basic processes. • Converting of unit's parameters to other working conditions. • Improvement of the Rankin cycle's parameters. • Classification of multistage cycles, cascade cycles. • Refrigerants: classification, nomenclature, legislation. • Sorption cycles: classification, thermodynamic fundaments of multicomponent systems, absorption cycles LiBr-H20 - basic form, basic processes. • Heat pumps: heating and hot tap water. • Heat sources for HP Industrial Heating, Ventilation, Airconditioning 4 Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems A5M34ELE Electronics ΚZ 4 A5M38SBD Collection and Data Transfer ΚZ 4 125PBZB Fire Services Fire water, hydrant systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting buildings against fire spread from technological equipment. Electric fire alarm. Fire control equipment. Backup power source. ΚZ Simulation of Building Energy Performance 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. 2162700 Experimental Methods 1 ΚZ 4 Introduction study of experimental technique in environmental engineering 2162064 Noise and Vibration Control ΚZ 4 Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise. Heat Supply 2162066 ΚZ 4 District heating with heat generators in heat-only and combined heat& power mode. Heat generators. Heating networks. Renewable energy sources in district heating. A5M34EZS Electronic security systems K7 4 A5M13NZZ Independent sources Electrochemical sources of the electric power - overview. Electrochemical sources (accumulators), applications. Uninteruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical enegy, storage of energy. A5M13FVS ΚZ 4 Photovoltaic Systems Solar energy and its exploitation using photovoltaic systems. Photovoltaic phenomena, solar cells and their characteristics, solar modules (construction, technology, parameters). Photovoltaic systems (including energy conservation). Photovoltaic system applications, optimisation of operating conditions. Basic economical and ecological aspects, present trends. Economics of Energy Use Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.

A5M16FIP Corporate finance KZ 4

Principles of finance, present value and alternative cost of capital, financial calculus, long-term finance, valuation of bonds and stocks, investment decision and net present value, IRR, comparison time period, annual equivalent value, inflation and return, capital asset pricing model, portfolio, sensitivity analysis and risk, short term finance, cash flow management. Dividend policy.

List of courses of this pass:

124INBB	Name of the course	Completion	Credits
IZTINDD	Integrated Design of Buildings	Z,ZK	4
The main objective	of the subject Integrated Building Design is to get an complex overview of the principles of integrated buildings design, life cycle assess	ssment of buildings	s, evaluation
	puilding performance, green/sustainable certification systems and understand environmental, social and economic aspects of the buil	t environment.	1
124KPKP	Building Structures - Final Review	ZK	4
_	tructures. Functional requirements, structural systems, spatial effect of the structural system. Vertical load-bearing structures, floor structures.		_
•	ings, windows, partitions, floors, suspended ceilings. Stairs, roof construction – timber roof trusses, roof envelopes. Foundation struct		lution of the
	ubstructure, waterproofing of the substructure. Structural systems of single and multi-storey buildings, structural systems of long-spar		
124OSIB	Lighting and Acoustics The course introduces students to the basics of building lighting technology and building acoustics and deepens further knowle	KZ edge.	4
124ST1	Thermal Engineering in Construction 1	ZK	5
· ·	ses the basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of providing	-	
	m non-construction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming		
125DPIB	Diploma Thesis	Z	26
Thesis of students	studying the Master's degree programme Intelligent Buildings. Independent final thesis usually in the form of a complex project, thec of the previous forms.	oretical work or a c	ombination
125EABU	Energy Audit of Building	KZ	4
Advanced course for	or introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy perfo	rmance directive f	or buildings
	culating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition	· ·	
	survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy co	•	
0 0	systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluation		
of environment prof	tection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is for	cused on the realis	tic buildings
	resulting to presenting case study report about energy audit of existing building.		
125EIBB	Electroengineering and intelligent buildings	KZ	4
	ciety, intelligent systems, new technologies significantly influence various HVAC system applications. The fundamental idea is to save		
optimal indoor and	outdoor environmental parameters. The influence of electromagnetic environment, electromagnetic compatibility, application of intellige	nt devices in buildir	ngs requires
105500	a system approach to solve the whole complex of HVAC and intelligent wiring.		
125ESB	Buildings Ecology Systems	KZ	4
Principles of enviro	nmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system d saving and special installations.		vices, wate
125MEC	Simulation of Building Energy Performance	KZ	4
The course is aim	ed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview o	f tools and method	dologies for
	ems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construc		-
	haviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build		
125OZEB	Renewable Energy Sources	ZK	4
	with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hydrogeneous control of the co	rn-are discussed ir	ndetail The
characteristics of	the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design fa		
	renewable energy sources.		
125PBZB	renewable energy sources. Fire Services		
125PBZB	ü.	cilities and system	s that use
125PBZB Fire water,hydrant	Fire Services	cilities and system	s that use
125PBZB	Fire Services systems,fire pipe,fire station.Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment.Protecting build technological equipment.Electric fire alarm. Fire control equipment. Backup power source.	cilities and system	s that use
125PBZB Fire water,hydrant 125PIB1	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build	cilities and system KZ dings against fire s	s that use 4 spread from
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub	Fire Services systems,fire pipe,fire station.Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment.Protecting build technological equipment.Electric fire alarm. Fire control equipment. Backup power source. Project 1	KZ dings against fire s Z ge from the Bache	s that use 4 spread from 6 elor's degree
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled s. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a tho	KZ dings against fire s Z ge from the Bache	s that use 4 spread from 6 elor's degree
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub to other discipline	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled s. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a tho state of the art from the literature.	KZ dings against fire s Z dge from the Bache rough analysis of t	4 spread from 6 lor's degree current 6
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub to other discipline 125PIB2 Project 2 is the su	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled is. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a tho state of the art from the literature. Project 2 bject of the interfaculty discipline Intelligent Buildings. In the project, the student demonstrates the ability to independently develop a field of intelligent buildings.	KZ dings against fire s Z ge from the Bache rough analysis of t Z more advanced pro-	4 spread from 6 she current 6 oject in the
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub to other discipline 125PIB2 Project 2 is the su	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled is. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a thosate of the art from the literature. Project 2 bject of the interfaculty discipline Intelligent Buildings. In the project, the student demonstrates the ability to independently develop a field of intelligent buildings. Building Systems	KZ dings against fire s Z dge from the Bache rough analysis of t Z more advanced pro	s that use 4 spread from 6 clor's degree the current 6 oject in the
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub to other discipline 125PIB2 Project 2 is the su 125SYB Multi-criteria analys	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled is. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a tho state of the art from the literature. Project 2 bject of the interfaculty discipline Intelligent Buildings. In the project, the student demonstrates the ability to independently develop a field of intelligent buildings.	KZ dings against fire s Z dge from the Bache rough analysis of t Z more advanced processes advanced proces	s that use 4 spread from 6 clor's degree the current 6 oject in the 4 ne design o
125PBZB Fire water,hydrant 125PIB1 Project 1 is the sub to other discipline 125PIB2 Project 2 is the su 125SYB Multi-criteria analys energy and ecologi	Fire Services systems, fire pipe, fire station. Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment. Protecting build technological equipment. Electric fire alarm. Fire control equipment. Backup power source. Project 1 ject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the knowled is. In the project, the student demonstrates the ability to independently develop a project in the field of intelligent buildings using a thosate of the art from the literature. Project 2 bject of the interfaculty discipline Intelligent Buildings. In the project, the student demonstrates the ability to independently develop a field of intelligent buildings. Building Systems sis of the requirements for the indoor environment and the function of the systems in different types of buildings and plants and optimic	KZ dings against fire s Z ge from the Bache rough analysis of t Z more advanced processes advanced proc	4 spread from 6 che current 6 coject in the 4 copes in terms
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0404400	absorption cycles LiBr-H20 - basic form, basic processes. • Heat pumps: heating and hot tap water. • Heat sources for HP	71/	
2161102	Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems	ZK	4
2161108	Transport Phenomena Z,Z	ZK	4
	Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment.	'	
2161109	Automatic control in environmental engineering of building Z,Z	ZK	4
Applic	cation of basic approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and sources	of heat.	
2161567	Ventilation and Air Conditioning Z,Z	ZK	4
lain knowledge fo	or design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity	y state an	d quality o
	air in residential and technological rooms.		
2162019	Industrial Heating, Ventilation, Airconditioning K	Z	4
Design ar	nd functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands	of system	ns.
2162035	Alternative Energy Sources K	Z	4
	Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.		
2162064	Noise and Vibration Control K	Z	4
	Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.	ı	
2162066	Heat Supply K	Z	4
	ing with heat generators in heat-only and combined heat&power mode. Heat generators. Heating networks. Renewable energy sources in c		ating.
2162113	Heating K	Z	4
	Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.		
2162700	Experimental Methods 1 K	Z	4
	Introduction study of experimental technique in environmental engineering		
A5M13FVS	Photovoltaic Systems K	Z	4
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