# 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	<b>Thermal Engineering in Construction</b> Jan Tywoniak <b>Jan Tywoniak</b> Jan Tywoniak (Gar.)	ZK	5	2P	Z	Z
124OSIB	Acoustics and Lighting 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 <b>Ji í Lettl</b> 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

Thermal Engineering in Construction	ZK	5
e 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
ction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from	civil engineering.	
Acoustics and Lighting	KZ	4
udents to the basics of building lighting technology and building acoustics and deepens further knowledge.		
Distribution of Electric Energy and Drives	Z,ZK	5
	basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of prov ction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from Acoustics and Lighting Idents to the basics of building lighting technology and building acoustics and deepens further knowledge.	basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of providing basic information bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from civil engineering. Acoustics and Lighting KZ Indents to the basics of building lighting technology and building acoustics and deepens further knowledge.

## 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.)	КZ	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 <b>Ji í Bašta</b> Ji í Bašta (Gar.)	Z,ZK	4	2P+1C	*	Z
2161567	Ventilation and Air Conditioning Vladimír Zmrhal, Petr Zelenský Vladimír Zmrhal Vladimír Zmrhal (Gar.)	Z,ZK	4	2P+1C	2	Z
A5M38SZS	Sensors and Networks Pavel Ripka, Antonín Platil Antonín Platil Pavel Ripka (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 subject of the interfaculty course Intelligent Buildings. Its content is focused on the issue of intelligent buildings in order to link the know	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	horough analysis	of the current
state of the art from the literature.		
125EABU Energy Audit of Building	KZ	4
Advanced course for introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy	performance direc	tive for buildings.
Methodology of calculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial cond	ition, description of	of initial condition
object survey and survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy	yy consumption - k	ouilding, heating,
lighting, ventilating systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical eva	luation, evaluation	from the aspect
of environment protection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar i	s focused on the r	ealistic buildings
resulting to presenting case study report about energy audit of existing building.		
125ESB Buildings Ecology Systems	KZ	4
Principles of environmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, syste	m design, pumpir	g devices, water
saving and special installations.		
2161109 Automatic control in environmental engineering of building	Z,ZK	4
Application of basic approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and source	s of heat.	
2161567 Ventilation and Air Conditioning	Z,ZK	4
Main knowledge for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of therma	I and humidity sta	te and quality of
air in residential and technological rooms.		
A5M38SZS Sensors and Networks	Z,ZK	4
Applications of sensors in buildings		

### 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, Roman Vav i ka <b>Ji í Bašta</b> 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, Hana Kabrhelová 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 Ζ 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 advanced project in the field of intelligent buildings. 2161102 Z,ZK 4 Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems Z,ZK B5M99SCT **Technology for Smart Cities** 4 4 125TECE ΚZ **Technological Units** Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems. 125SYB ΖK 4 **Building Systems** 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 buildings, sports 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

Ζ 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 aroun.

	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their					
Code	(in case of groups of courses the list of codes of their <b>members)</b> Tutors, <b>authors</b> and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
124KPKP	Building Structures Ctislav Fiala Ctislav Fiala (Gar.)	ZK	4	3P	Z	PV
125OZEB	Renewable Energy Sources Michal Kabrhel Michal Kabrhel Michal Kabrhel (Gar.)	ZK	4	2P	Z	PV
124INBB	Integrated Design of Buildings Jan R ži ka, Petr Hájek, Antonín Lupíšek Antonín Lupíšek Petr Hájek (Gar.)	Z,ZK	4	2P+1C	z	PV
125EIBB	Electroengineering and intelligent buildings Bohumír Garlík, Hana Kabrhelová Bohumír Garlík Bohumír Garlík (Gar.)	KZ	4	2P	Z	PV
2161108	Transport Phenomena Martin Barták Martin Barták Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	PV
2162113	<b>Heating</b> Jií Bašta, Jind ich Bohá , Roman Vav i ka <b>Jií Bašta</b> Jií Bašta (Gar.)	KZ	4	2P+2C	1	PV
A5M15ES1	Electrical Light 1 Petr Žák, Petr Žák Petr Žák (Gar.)	KZ	4	2P+1S	Z	PV
A5M38MEB	Measurements in the Buildings 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, Adam Bou a Alexandr Laposa Alexandr Laposa (Gar.)	KZ	4	3P+1L	L	PV
A5M38SBD	Collection and Data Transfer Pavel Mlejnek Pavel Mlejnek (Gar.)	KZ	4	2P+1L	L	PV
125PBZB	Fire Services Ilona Koubková, Bohumír Garlík, Daniel Adamovský, Pavla Hofbauer Pechová Ilona Koubková Ilona Koubková (Gar.)	КZ	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 <b>Tomáš Matuška</b> Tomáš Matuška (Gar.)	KZ	4	2P+1C	3	PV

A5M34EZS	Electronic security systems Miroslav Husák, Jan Novák, Tomáš Teplý, Václav Prajzler Václav Prajzler Václav Prajzler (Gar.)	KZ	4	3P+1L	Z	PV
A5M13NZZ	Independent sources Pavel Hrzina, Václav Papež <b>Pavel Hrzina</b> Pavel Hrzina (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	L	PV
A5M16EUE	Economics of Energy Use Ji í Beranovský, Július Bemš <b>Ji í Beranovský</b> Július Bemš (Gar.)	KZ	4	3P+1C	Z	PV
A5M16FIP	Corporate finance Old ich Starý, Ji í Vaší ek, Blanka Ku erková <b>Ji í Vaší ek</b> Old ich Starý (Gar.)	KZ	4	3P+1C	L	PV
Characteristics of	the courses of this group of Study Plan: Code=NX2020_1 Name=I	nteligentní b	udovy, j	povinn ve	olitelné p	edm ty
124KPKP	Building Structures				ZK	4
Envelopes of buildings,	ures. Functional requirements, structural systems, spatial effect of the structural system. Verti windows, partitions, floors, suspended ceilings. Stairs, roof construction timber roof trusses	, roof envelopes.	Foundatio	n structures, s	-	-
	fing of the substructure. Structural systems of single and multi-storey buildings, structural s	ystems of long-sp	ban structu		-	
125OZEB	Renewable Energy Sources			1	ZK	4
	enewable energy sources and building energy systems. The different types of energy-solar, ergies and the most appropriate methods of use are described. Attention is paid to underst		-	-		
renewable energy source		anding the correct	ci way to d	esign lacilities	and system	is that use
				7	71/	4
124INBB	Integrated Design of Buildings	مام منه بالمالية ما م			,ZK	-
	e subject Integrated Building Design is to get an complex overview of the principles of integr	•	•		ent of buildin	igs, evaluation
	, green/sustainable certification systems and understand environmental, social and econom	nic aspects of the	e built envir			
125EIBB	Electroengineering and intelligent buildings			1	KZ	4
-	intelligent systems, new technologies significantly influence various HVAC system applicat					
•	por environmental parameters. The influence of electromagnetic environment, electromagnet	ic compatibility, a	pplication of	of intelligent de	evices in buil	dings requires
a system approach to so	olve the whole complex of HVAC and intelligent wiring.					
2161108	Transport Phenomena			Z	,ZK	4
Basics of transport pher	nomena for the study programme Intelligent Buildings. Momentum, heat and mass transpor	t in built environm	nent.			
2162113	Heating				κz	4
Knowledge improvemen	t from the field of heating of residential and industrial buildings. Designing of convective and	d radiant heating	systems.	,		
A5M15ES1	Electrical Light 1				ΚZ	4
A5M38MEB	Measurements in the Buildings				κz	4
	about principles of measurement of basic physical quantities in the building. As the majority	of the physical a	uantities a	1	1	
	int of the electrical quantities is also presented. The subject is not intended for students who					-
Sensors and transducer		Thave all cady st			icai measai	cificint and
2162035					/7	4
	Alternative Energy Sources			1	KZ	4
	alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.	•			/7	4
	Refrigertion and heat pumps			1	KZ	4
	ction to the refrigeration technology and the heat pumps with the following thematic areas: Fur					
	, basic processes. Converting of units parameters to other working conditions. Improvement	,				• •
, ,	rants: classification, nomenclature, legislation. Sorption cycles: classification, thermodynamic	fundaments of m	ulticompon	ent systems, a	absorption c	ycles LiBr-H20
	esses. Heat pumps: heating and hot tap water. Heat sources for HP					
2162019	Industrial Heating, Ventilation, Airconditioning				KZ	4
Design and functional p	roperties of ventilation systems for technological premises. Heat and mass transfer, aerody	namics calculatio	on. Energy	demands of s	ystems.	
A5M34ELE	Electronics				KZ	4
A5M38SBD	Collection and Data Transfer				κz	4
125PBZB	Fire Services				κz	4
	ms,fire pipe,fire station.Fixed fire-fighting water with water mist, foam, and halon. Special fir	re-fiahtina equipn	nent.Prote			-
	t.Electric fire alarm. Fire control equipment. Backup power source.	5 5 1 1		5 5	- J	
125MEC	Simulation of Building Energy Performance				κz	4
	explaining the issues of modelling and simulation of energy behaviour of buildings. Students	s will be introduce	ed to an ov	1		
	and learn how to use the simulation software DesignBuilder. In addition, they will be introduce					-
<b>e</b> .	aim of the course is to provide students with basic knowledge and practical experience in r					
2162700			ialating ba		KZ	4
1	Experimental Methods 1			'		4
	berimental technique in environmental engineering				/7	
2162064	Noise and Vibration Control			1	KZ	4
	about the basic acoustic dimensions, which are important for evaluation of noise.					
	Heat Supply				KZ	4
-	t generators in heat-only and combined heat&power mode. Heat generators. Heating i	networks. Renew	able energ	-		ng.
A5M34EZS	Electronic security systems				KZ	4
A5M13NZZ	Independent sources				KZ	4
	s of the electric power - overview. Electrochemical sources (accumulators), applications. Un	interuptible powe	er sources	in IB. Other so	ources of the	e electrical
	rces of electrical enegy, storage of energy.					
<u>.</u>	Photovoltaic Systems				κz	4
	ploitation using photovoltaic systems. Photovoltaic phenomena, solar cells and their charact	eristics. solar mo	dules (con			-
	icluding energy conservation). Photovoltaic system applications, optimisation of operating of		-			
A5M16EUE					KZ	4
I	Economics of Energy Use	norau bolonce. E	norau aha	1	1	•
	y management of company, buildings or energy systems. Energy need and consumption, e					Secondary
energy sources. Energy	audit and feasibility study, optimization of energy management of energy systems. Prices a	and tariiis, econol	ing and IN	andial analysis	э.	

A5M16FIP	Corporate finance	KZ	4
Principles of finance, pr	esent value and alternative cost of capital, financial calculus, long-term finance, valuation of bonds and stocks, investment de	cision and net pre	sent value, IRR,
comparison time period,	annual equivalent value, inflation and return, capital asset pricing model, portfolio, sensitivity analysis and risk, short term finance	e, cash flow manag	gement.Dividend
policy.			

# List of courses of this pass:

	Name of the course	Completion	Credits
124INBB	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 asse	ssment of buildings	s, evaluatio
of	building performance, green/sustainable certification systems and understand environmental, social and economic aspects of the bui	lt environment.	
124KPKP	Building Structures	ZK	4
Basics of building s	structures. Functional requirements, structural systems, spatial effect of the structural system. Vertical load-bearing structures, floor structures	ctures, overhangin	g structure
Envelopes of buil	dings, windows, partitions, floors, suspended ceilings. Stairs, roof construction timber roof trusses, roof envelopes. Foundation structu	ures, structural solu	ution of the
s	substructure, waterproofing of the substructure. Structural systems of single and multi-storey buildings, structural systems of long-spa	n structures.	
124OSIB	Acoustics and Lighting	KZ	4
	The course introduces students to the basics of building lighting technology and building acoustics and deepens further knowledge and building acoustics and deepens further knowledge acoustic	edge.	•
124ST1	Thermal Engineering in Construction	ZK	5
The subject discus	ses the basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of providin	g basic informatior	to student
coming fro	m non-construction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming	from civil engineer	ring.
125DPIB	Diploma Thesis	Z	26
Thesis of students	s studying the Master's degree programme Intelligent Buildings. Independent final thesis usually in the form of a complex project, the	bretical work or a c	ombinatior
	of the previous forms.		
125EABU	Energy Audit of Building	KZ	4
	or introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance of buildings, legislation.	1	or building
Methodology of ca	Iculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition	n, description of init	tial conditio
object survey and	survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy c	onsumption - build	ing, heating
lighting, ventilating	systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluat	ion, evaluation fror	n the aspec
of environment pro	tection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is fo	cused on the realis	stic building
	resulting to presenting case study report about energy audit of existing building.		
125EIBB	Electroengineering and intelligent buildings	KZ	4
The information so	ciety, intelligent systems, new technologies significantly influence various HVAC system applications. The fundamental idea is to save	e energy, materials	and ensur
optimal indoor and	outdoor environmental parameters. The influence of electromagnetic environment, electromagnetic compatibility, application of intellige	nt devices in buildi	ngs require
	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 of	lesign, pumping de	vices, wate
	saving and special installations.		
125MEC	Simulation of Building Energy Performance	KZ	4
	Simulation of Building Energy Performance ned at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of		
The course is aim		of tools and method	dologies for
The course is aim solving these probl	ed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of	of tools and methoo ction and other fact	dologies for ors affectin
The course is aim solving these probl	ed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of lems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct	of tools and methoo ction and other fact	dologies for ors affectin
The course is aim solving these problemulting be building be 1250ZEB	ed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of lems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct analysis of the course is to provide students with basic knowledge and practical experience in modelling and simulating build build build	f tools and method ction and other fact ding energy behavi ZK	dologies for ors affectin iour.
The course is aim solving these probl building be 125OZEB The course deals	hed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of lems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct shaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build Renewable Energy Sources	f tools and method ction and other fact ding energy behavi ZK ro-are discussed ir	dologies for ors affecting iour. 4 n detail. The
The course is aim solving these probl building be 125OZEB The course deals	eed at explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of tems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct the addition. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build Renewable Energy Sources with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hydrogenergy systems.	f tools and method ction and other fact ding energy behavi ZK ro-are discussed ir	dologies for ors affecting iour. 4 n detail. The
The course is aim solving these probl building be 125OZEB The course deals	And a texplaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of terms and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct shaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build Renewable Energy Sources with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hyd f the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design far renewable energy sources.	f tools and method ction and other fact ding energy behavi ZK ro-are discussed ir	dologies for ors affecting iour. 4 n detail. The
The course is aim solving these probl building be 125OZEB The course deals characteristics of 125PBZB	And a texplaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of tems and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct shaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build Renewable Energy Sources with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hyd f the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design factors.	f tools and method ction and other fact ding energy behavi ZK ro-are discussed in acilities and system KZ	dologies for ors affecting jour. 4 n detail. The is that use 4
The course is aim solving these probl building be 125OZEB The course deals characteristics of 125PBZB	A explaining the issues of modelling and simulation of energy behaviour of buildings. Students will be introduced to an overview of terms and learn how to use the simulation software DesignBuilder. In addition, they will be introduced to climate data, materials, construct shaviour. The aim of the course is to provide students with basic knowledge and practical experience in modelling and simulating build Renewable Energy Sources with renewable energy sources and building energy systems. The different types of energy-solar, wind, biomass, geothermal and hyd f the energies and the most appropriate methods of use are described. Attention is paid to understanding the correct way to design far renewable energy sources. Fire Services	f tools and method ction and other fact ding energy behavi ZK ro-are discussed in acilities and system KZ	dologies for ors affectin jour. 4 n detail. The is that use
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	- basic form, basic processes. Heat pumps: heating and hot tap water. Heat sources for HP		
2161102	Radiant and Industrial Heating	Z,ZK	4
	Student will be informed about the basics of radiant and other industrial heating systems		I
2161108	Transport Phenomena	Z,ZK	4
	Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built en	vironment.	
2161109	Automatic control in environmental engineering of building	Z,ZK	4
Applica	ation 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,ZK	4
Main knowledge fo	r design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of therma	I and humidity state ar	nd quality o
	air in residential and technological rooms.		-
2162019	Industrial Heating, Ventilation, Airconditioning	KZ	4
	nd functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Ener		ns.
2162035	Alternative Energy Sources	KZ	4
	Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.		
2162064	Noise and Vibration Control	KZ	4
	Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.		
2162066	Heat Supply	KZ	4
	ng with heat generators in heat-only and combined heat&power mode. Heat generators. Heating networks. Renewable energ		. <u> </u>
2162113	Heating	KZ	4
	Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heat		
2162700	Experimental Methods 1	KZ	4
	Introduction study of experimental technique in environmental engineering		
A5M13FVS	Photovoltaic Systems	KZ	4
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