

Study plan

Name of study plan: Intelligent Buildings

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study:

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: platí pro nástup od roku 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 Jiří Lettl, Pavel Mindl, Jan Bauer Jiří Lettl Jiří 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
124OSIB	Lighting and Acoustics	KZ	4
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, Karel Papež, Bohumír Garlík, Daniel Adamovský, Miroslav Urban, Hana Kabrhelová Michal Kabrhel (Gar.)	Z	6	4C	L	z
125EABU	Energy Audit of Building Ilona Koubková, Michal Kabrhel, Karel Kabele, Stanislav Frolík, Miroslav Urban, Hana Kabrhelová Hana Kabrhelová Karel Kabele (Gar.)	KZ	4	2P+1C	L	z
125ESB	Buildings Ecology Systems Ilona Koubková, Stanislav Frolík, Hana Kabrhelová Hana Kabrhelová Stanislav Frolík (Gar.)	KZ	4	2P	L	z

2161109	Automatic control in environmental engineering of building <i>Ji í Bašta</i>	Z,ZK	4	2P+1C	*	z
2161567	Ventilation and Air Conditioning	Z,ZK	4	2P+1C	2	z
A5M38SZS	Sensors and Networks <i>Antonín Platil, Pavel Ripka Antonín Platil Pavel Ripka (Gar.)</i>	Z,ZK	4	2P+1L	Z	z

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

125PIB1	Project 1				Z	6
The Project 1 is the subject of an inter-faculty field of Intelligent Buildings. Its content is focused on intelligent buildings to connect knowledge from undergraduate studies to other disciplines. Students in the project demonstrates the ability to independently handle project in intelligent buildings using a thorough analysis of current problems 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 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.						
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, system design, pumping 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 sources 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 thermal and humidity state 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
125PIB2	Project 2 <i>Hana Kabrhelová Michal Kabrhel (Gar.)</i>	Z	6	4C	Z	z
2161102	Radiant and Industrial Heating <i>Ji í Bašta, Jind ich Bohá Ji í Bašta Ji í Bašta (Gar.)</i>	Z,ZK	4	2P+1C	*	z
A5M33IZS	Information and Knowledge-Based Systems <i>Martin imná Martin imná Martin imná (Gar.)</i>	Z,ZK	4	2P+1C	L	z
125TECE	Technological Units <i>Ilona Koubková, Karel Kabele, Stanislav Frolík Hana Kabrhelová Ilona Koubková (Gar.)</i>	KZ	4	2P	Z	z
125SYB	Building Systems <i>Jan Tywoniak, Karel Kabele, Stanislav Frolík, Hana Kabrhelová, Roman Musil Hana Kabrhelová Karel Kabele (Gar.)</i>	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
The Project 2 is the subject of an inter-faculty field of Intelligent Buildings. Students in the project demonstrates the ability to independently handle project in intelligent buildings.						
2161102	Radiant and Industrial Heating				Z,ZK	4
Student will be informed about the basics of radiant and other industrial heating systems						
A5M33IZS	Information and Knowledge-Based Systems				Z,ZK	4
The course provides the student with a necessary overview of information technologies with attention paid to requirements of intelligent building information systems. Further on, the student learns the basic methods and techniques applicable to knowledge based systems aimed at automated solving of decision-making problems. The attention is paid namely to data and knowledge representation and its modeling so that the students are able to communicate effectively with IT and knowledge engineering experts. The students will also learn the basics of networking protocols used in intelligent buildings.						
125TECE	Technological Units				KZ	4
Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.						
125SYB	Building Systems				ZK	4

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
125DPIB	Diploma Thesis <i>Hana Kabrhelová Michal Kabrhel (Gar.)</i>	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	The thesis is the final article in which the student demonstrates the ability to independently handle the topic for the building services systems. The student consults his work with the supervisor of the thesis. Themes of work and type of treatment may be different.		
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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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
124KPKP	Building Structures - Final Review <i>Čtislav Fiala Čtislav Fiala Čtislav Fiala (Gar.)</i>	ZK	4	3P	Z	PV
125OZEB	Renewable Energy Sources <i>Ilona Koubková, Michal Kabrhel, Karel Kabele, Stanislav Frolík, Hana Kabrhelová Hana Kabrhelová Michal Kabrhel (Gar.)</i>	ZK	4	2P	L	PV
124INBB	Integrated Design of Buildings <i>Petr Hájek, Antonín Lupíšek Antonín Lupíšek Petr Hájek (Gar.)</i>	Z,ZK	4	2P+1C		PV
125EIBB	Electroengineering and intelligent buildings <i>Ilona Koubková, Karel Kabele, Stanislav Frolík, Bohumír Garlík, Hana Kabrhelová Bohumír Garlík Bohumír Garlík (Gar.)</i>	KZ	4	2P	Z	PV
2161108	Transport Phenomena <i>Martin Barták Martin Barták Martin Barták (Gar.)</i>	Z,ZK	4	2P+1C	*	PV
2162113	Heating <i>Jiří Bašta, Jindřich Boháč, Roman Vavřina Jiří Bašta Jiří Bašta (Gar.)</i>	KZ	4	2P+2C	1	PV
A5M15ES1	Electrical Light 1 <i>Petr Žák Petr Žák</i>	KZ	4	2P+1S	Z	PV
A5M38MEB	Measurements in the Buildings <i>Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)</i>	KZ	4	2P+1L	Z	PV
2162035	Alternative Energy Sources <i>Tomáš Matuška</i>	KZ	4	2P+1C	*	PV
2151154	Refrigeration and heat pumps	KZ	4	3P+1C		PV
2162019	Industrial Heating, Ventilation, Airconditioning	KZ	4	2P+1C	2	PV
A5M34ELE	Electronics <i>Adam Bouša, Vít Záhlava Adam Bouša Adam Bouša (Gar.)</i>	KZ	4	3P+1L	L	PV
A5M38SBD	Collection and Data Transfer <i>Pavel Mlejnek Pavel Mlejnek Pavel Mlejnek (Gar.)</i>	KZ	4	2P+1C	L	PV
125PBZB	Fire Services <i>Ilona Koubková, Karel Kabele, Stanislav Frolík, Karel Papež, Bohumír Garlík, Hana Kabrhelová Hana Kabrhelová Ilona Koubková (Gar.)</i>	KZ	4	2P	L	PV
125MEC	Simulation of Building Energy Performance <i>Ilona Koubková, Karel Kabele, Stanislav Frolík, Hana Kabrhelová Hana Kabrhelová Karel Kabele (Gar.)</i>	KZ	4	1P+1C	Z	PV
2162700	Experimental Methods 1 <i>Miroslav Kušera Miroslav Kušera Miroslav Kušera (Gar.)</i>	KZ	4	0P+4L	*	PV
2162064	Noise and Vibration Control <i>Miroslav Kušera, Richard Nový Miroslav Kušera Miroslav Kušera (Gar.)</i>	KZ	4	2P+1C	*	PV
2162066	Heat Supply <i>Tomáš Matuška Tomáš Matuška Tomáš Matuška (Gar.)</i>	KZ	4	2P+1C	3	PV
A5M34EZZ	Electronic security systems <i>Miroslav Husák, Jan Novák Miroslav Husák (Gar.)</i>	KZ	4	3P+1L	Z	PV
A5M13NZZ	Independent sources <i>Karel Dušek, Václav Papež Karel Dušek Karel Dušek (Gar.)</i>	KZ	4	3P+1L	Z	PV

A5M13FVS	Photovoltaic Systems <i>Jakub Holovský, Ladislava erná, Vít zslav Benda Jakub Holovský Jakub Holovský (Gar.)</i>	KZ	4	3P+1L	Z	PV
A5M16EUE	Economics of Energy Use <i>Ji í Beranovský Ji í Beranovský Ji í Beranovský (Gar.)</i>	KZ	4	3P+1C	Z	PV
A5M16FIP	Corporate finance <i>Old ich Starý, Ji í Vaší ek Old ich Starý (Gar.)</i>	KZ	4	3P+1C	L	PV

Characteristics of the courses of this group of Study Plan: Code=NX2020_1 Name=Inteligentní budovy, povinn volitelné p edm ty

124KPKP	Building Structures - Final Review			ZK	4
125OZEB	Renewable Energy Sources The course deals with renewable energy sources and energy systems in buildings. The various types of energy are discussed in detail - solar, wind, biomass, geothermal and hydro. Described are the characteristics of energy utilization and appropriate ways.			ZK	4
124INBB	Integrated Design of Buildings			Z,ZK	4
125EIBB	Electroengineering and intelligent buildings Construction of intelligent buildings (IB) is founded on mathematical-physical principles and draws from various definitions of IB. The information society, intelligent systems, new technologies, and nanotechnologies have significant impact on various system applications of technical equipment of buildings. The underlying idea is mainly energy and material saving and provision of the optimum parameters of indoor and outdoor environment. A new field rises, focused on user oriented building industry. Influence of electromagnetic environment, electromagnetic compatibility, implementation of intelligently operating equipment in buildings requires a systemic approach to solution of the whole complex of technical equipment of buildings. To let the students have a good grasp on new solutions within technical equipment of buildings and construction of IB, this subject aims to present a general view of such solutions. In a transparent form via examples, description of existing and future IB solutions, explanation of logical systems, including logical PLC control and IRC control of building on the room level, communications and implementation of fuzzy control shall be provided. New installation of LonWorks networks inside the building shall be described, same as intelligent ABB i-bus and KNX/EIB wiring, aimed at energy saving. The final part of the lectures shall concentrate on electronic access control and fire alarm security systems within the integrated control system.			KZ	4
2161108	Transport Phenomena Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment.			Z,ZK	4
2162113	Heating Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.			KZ	4
A5M15ES1	Electrical Light 1			KZ	4
A5M38MEB	Measurements in the Buildings 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.			KZ	4
2162035	Alternative Energy Sources Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.			KZ	4
2151154	Refrigeration and heat pumps 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 fundamentals of multicomponent systems, absorption cycles LiBr-H2O - basic form, basic processes. • Heat pumps: heating and hot tap water. • Heat sources for HP			KZ	4
2162019	Industrial Heating, Ventilation, Airconditioning Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems.			KZ	4
A5M34ELE	Electronics			KZ	4
A5M38SBD	Collection and Data Transfer			KZ	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.			KZ	4
125MEC	Simulation of Building Energy Performance Introductory course for modelling and simulation of building energy performance.			KZ	4
2162700	Experimental Methods 1 Introduction study of experimental technique in environmental engineering			KZ	4
2162064	Noise and Vibration Control Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.			KZ	4
2162066	Heat Supply District heating with heat generators in heat-only and combined heat&power mode. Heat generators. Heating networks. Renewable energy sources in district heating.			KZ	4
A5M34EZS	Electronic security systems			KZ	4
A5M13NZZ	Independent sources Electrochemical sources of the electric power - overview. Electrochemical sources (accumulators), applications. Uninterruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical energy, storage of energy.			KZ	4
A5M13FVS	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.			KZ	4
A5M16EUE	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.			KZ	4
A5M16FIP	Corporate finance 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.			KZ	4

List of courses of this pass:

Code	Name of the course	Completion	Credits
124INBB	Integrated Design of Buildings	Z,ZK	4
124KPKP	Building Structures - Final Review	ZK	4
124OSIB	Lighting and Acoustics	KZ	4
124ST1	Thermal Engineering in Construction 1	ZK	5
125DPIB	Diploma Thesis	Z	26
The thesis is the final article in which the student demonstrates the ability to independently handle the topic for the building services systems. The student consults his work with the supervisor of the thesis. Themes of work and type of treatment may be different.			
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 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.			
125EIBB	Electroengineering and intelligent buildings	KZ	4
Construction of intelligent buildings (IB) is founded on mathematical-physical principles and draws from various definitions of IB. The information society, intelligent systems, new technologies, and nanotechnologies have significant impact on various system applications of technical equipment of buildings. The underlying idea is mainly energy and material saving and provision of the optimum parameters of indoor and outdoor environment. A new field rises, focused on user oriented building industry. Influence of electromagnetic environment, electromagnetic compatibility, implementation of intelligently operating equipment in buildings requires a systemic approach to solution of the whole complex of technical equipment of buildings. To let the students have a good grasp on new solutions within technical equipment of buildings and construction of IB, this subject aims to present a general view of such solutions. In a transparent form via examples, description of existing and future IB solutions, explanation of logical systems, including logical PLC control and IRC control of building on the room level, communications and implementation of fuzzy control shall be provided. New installation of LonWorks networks inside the building shall be described, same as intelligent ABB i-bus and KNX/EIB wiring, aimed at energy saving. The final part of the lectures shall concentrate on electronic access control and fire alarm security systems within the integrated control system.			
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, system design, pumping devices, water saving and special installations.			
125MEC	Simulation of Building Energy Performance	KZ	4
Introductory course for modelling and simulation of building energy performance.			
125OZEB	Renewable Energy Sources	ZK	4
The course deals with renewable energy sources and energy systems in buildings. The various types of energy are discussed in detail - solar, wind, biomass, geothermal and hydro. Described are the characteristics of energy utilization and appropriate ways.			
125PBZB	Fire Services	KZ	4
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.			
125PIB1	Project 1	Z	6
The Project 1 is the subject of an inter-faculty field of Intelligent Buildings. Its content is focused on intelligent buildings to connect knowledge from undergraduate studies to other disciplines. Students in the project demonstrates the ability to independently handle project in intelligent buildings using a thorough analysis of current problems from the literature.			
125PIB2	Project 2	Z	6
The Project 2 is the subject of an inter-faculty field of Intelligent Buildings. Students in the project demonstrates the ability to independently handle project in intelligent buildings.			
125SYB	Building Systems	ZK	4
125TECE	Technological Units	KZ	4
Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.			
2151154	Refrigeration and heat pumps	KZ	4
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 fundamentals of multicomponent systems, absorption cycles LiBr-H ₂ O - 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			
2161108	Transport Phenomena	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,ZK	4
Application 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 for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity state and quality of air in residential and technological rooms.			
2162019	Industrial Heating, Ventilation, Airconditioning	KZ	4
Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems.			
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 District heating with heat generators in heat-only and combined heat&power mode. Heat generators. Heating networks. Renewable energy sources in district heating.	KZ	4
2162113	Heating Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.	KZ	4
2162700	Experimental Methods 1 Introduction study of experimental technique in environmental engineering	KZ	4
A5M13FVS	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.	KZ	4
A5M13NZZ	Independent sources Electrochemical sources of the electric power - overview. Electrochemical sources (accumulators), applications. Uninterruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical energy, storage of energy.	KZ	4
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5
A5M15ES1	Electrical Light 1	KZ	4
A5M16EUE	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.	KZ	4
A5M16FIP	Corporate finance 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.	KZ	4
A5M33IZS	Information and Knowledge-Based Systems The course provides the student with a necessary overview of information technologies with attention paid to requirements of intelligent building information systems. Further on, the student learns the basic methods and techniques applicable to knowledge based systems aimed at automated solving of decision-making problems. The attention is paid namely to data and knowledge representation and its modeling so that the students are able to communicate effectively with IT and knowledge engineering experts. The students will also learn the basics of networking protocols used in intelligent buildings.	Z,ZK	4
A5M34ELE	Electronics	KZ	4
A5M34EZS	Electronic security systems	KZ	4
A5M38MEB	Measurements in the Buildings 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.	KZ	4
A5M38SBD	Collection and Data Transfer	KZ	4
A5M38SZS	Sensors and Networks Applications of sensors in buildings	Z,ZK	4

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

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