

# Study plan

## Name of study plan: Inteligentní budovy - platný od roku 2012

Faculty/Institute/Others: Faculty of Electrical Engineering  
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: 116  
Elective courses credits: 4  
Sum of credits in the plan: 120  
Note on the plan:

Name of the block: Compulsory courses in the program  
Minimal number of credits of the block: 84  
The role of the block: P

Code of the group: MIBBME  
Name of the group: Safety of the master's studies  
Requirement credits in the group:  
Requirement courses in the group: In this group you have to complete at least 1 course  
Credits in the group: 0  
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
BEZM	<b>Safety in Electrical Engineering for a master's degree</b> Vladimír K la, Radek Havlí ek, Ivana Nová, Josef ernohous Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z	P

### Characteristics of the courses of this group of Study Plan: Code=MIBBME Name=Safety of the master's studies

BEZM	Safety in Electrical Engineering for a master's degree	Z	0
The course provides for students of all programs periodic training guidelines for health and occupational safety and gives knowledge of electrical hazard of given branch of study. Students receive indispensable qualification according to the current Directive of the Dean.			

Code of the group: MIBDIP1  
Name of the group: Diploma Thesis  
Requirement credits in the group: In this group you have to gain at least 26 credits (at most 52)  
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
A5M99DIP	<b>Diploma Thesis</b> Petr Kašpar	Z	26	0P+20C	L	P
ADIP26	<b>Diploma Thesis</b>	Z	26	36s	L	P

### Characteristics of the courses of this group of Study Plan: Code=MIBDIP1 Name=Diploma Thesis

A5M99DIP	Diploma Thesis	Z	26
ADIP26	Diploma Thesis	Z	26
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			

Code of the group: MIBP  
Name of the group: Compulsory subjects of the program

Requirement credits in the group: In this group you have to gain 46 credits

Requirement courses in the group: In this group you have to complete 11 courses

Credits in the group: 46

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
125ESB	<b>Buildings Ecology Systems</b> <i>Hana Kabrhelová</i>	KZ	4	2P	L	P
125EABI	<b>Energy Audit of Building</b> <i>Hana Kabrhelová</i>	KZ	4	2P	L	P
2161110	<b>Air Conditioning and Industrial Ventilation</b>	Z,ZK	4	2P+1C	*	P
124KPKP	<b>Building Structures - Final Review</b> <i>Čtislav Fiala Čtislav Fiala Čtislav Fiala (Gar.)</i>	ZK	4	3P	Z	P
124OSIB	<b>Lighting and Acoustics</b> <i>Jaroslav Vychytil, Lenka Maierová Jaroslav Vychytil Jaroslav Vychytil (Gar.)</i>	KZ	4	2P	Z	P
2161108	<b>Transport Phenomena</b> <i>Martin Barták Martin Barták Martin Barták (Gar.)</i>	Z,ZK	4	2P+1C	*	P
2161109	<b>Automatic control in environmental engineering of building</b> <i>Jiří Bašta</i>	Z,ZK	4	2P+1C	*	P
A5M14RPI	<b>Distribution of Electric Energy and Drives</b> <i>Jiří Lettl, Pavel Mindl, Jan Bauer Jiří Lettl Jiří Lettl (Gar.)</i>	Z,ZK	5	2P+1L	Z	P
2161102	<b>Radiant and Industrial Heating</b> <i>Jiří Bašta, Jindřich Bohá Jiří Bašta Jiří Bašta (Gar.)</i>	Z,ZK	4	2P+1C	*	P
A5M38SZS	<b>Sensors and Networks</b> <i>Antonín Platil, Pavel Ripka Antonín Platil Pavel Ripka (Gar.)</i>	Z,ZK	4	2P+1L	L	P
124ST1	<b>Thermal Engineering in Construction 1</b> <i>Jan Tywoniak Jan Tywoniak Jan Tywoniak (Gar.)</i>	ZK	5	2P	Z	P
2161567	<b>Ventilation and Air Conditioning</b> <i>Vladimír Zmrhal</i>	Z,ZK	4	2P+1C	2	P

**Characteristics of the courses of this group of Study Plan: Code=MIBP Name=Compulsory subjects of the programm**

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.			
125EABI	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.			
2161110	Air Conditioning and Industrial Ventilation	Z,ZK	4
Main functional elements of ventilation and air conditioning systems. Air conditioning systems. Ventilation systems for residential and technological rooms.			
124KPKP	Building Structures - Final Review	ZK	4
124OSIB	Lighting and Acoustics	KZ	4
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.			
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5
2161102	Radiant and Industrial Heating	Z,ZK	4
Student will be informed about the basics of radiant and other industrial heating systems			
A5M38SZS	Sensors and Networks	Z,ZK	4
Applications of sensors in buildings			
124ST1	Thermal Engineering in Construction 1	ZK	5
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.			

Code of the group: MIBPRO1

Name of the group: Project 1

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

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

Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2163033	<b>Design IB I.</b> <i>Jiří Bašta</i>	Z	6	0P+4C	*	P
125PIB1	<b>Project 1</b> <i>Hana Kabrhelová</i>	Z	6	4C	L	P
A5M99PR1	<b>Project 1</b> <i>Petr Kašpar</i>	Z	6	0P+4C	L	P

**Characteristics of the courses of this group of Study Plan: Code=MIBPRO1 Name=Project 1**

2163033	Design IB I. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	6			
125PIB1	Project 1 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.	Z	6			
A5M99PR1	Project 1 The topic of the thesis is chosen by the student and selected from the list of topics. "Project 1" is followed by "Project 2" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6			

Code of the group: MIBPRO2

Name of the group: Project 2

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

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

Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2163034	<b>Project IB II.</b> <i>Jiří Bašta Jiří Bašta (Gar.)</i>	Z	6	0P+4C	*	P
125PIB2	<b>Project 2</b> <i>Hana Kabrhelová Michal Kabrhel (Gar.)</i>	Z	6	4C	Z	P
A5M99PR2	<b>Project 2</b> <i>Petr Kašpar</i>	Z	6	0P+4C	Z	P

**Characteristics of the courses of this group of Study Plan: Code=MIBPRO2 Name=Project 2**

2163034	Project IB II. Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.	Z	6			
125PIB2	Project 2 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.	Z	6			
A5M99PR2	Project 2 The topic of the thesis is chosen by the student and selected from the list of topics. Project 2 mostly follows the topic of "Project 1" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6			

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: MIBPVP

Name of the group: Compulsory optionally subjects

Requirement credits in the group: In this group you have to gain at least 32 credits (at most 116)

Requirement courses in the group: In this group you have to complete at least 8 courses ( at most 29)

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
A5M02AKA	<b>Acoustic Applications</b>	KZ	4	2P+2L	L	PV
2162035	<b>Alternative Energy Sources</b> <i>Tomáš Matuška</i>	KZ	4	2P+1C	*	PV
A5M17BUP	<b>Biological Effects of Electromagnetic Field</b>	KZ	4	2P+2L	L	PV

2152060	<b>Refrigeration Technique and Heat Pumps for Intelligent Buildings</b>	KZ	4	3P+1C	*	PV
A5M16EUE	<b>Economics of Energy Use</b> <i>Jiří Beranovský Jiří Beranovský Jiří Beranovský (Gar.)</i>	KZ	4	3P+1C	Z	PV
A5M15ES1	<b>Electrical Light 1</b> <i>Petr Žák, Petr Žák</i>	KZ	4	2P+1S	Z	PV
A5M38BEM	<b>Electromagnetic compatibility</b>	KZ	4	1P+1L	Z	PV
A5M34EZS	<b>Electronic security systems</b> <i>Miroslav Husák, Jan Novák Jan Novák Miroslav Husák (Gar.)</i>	KZ	4	3P+1L	Z	PV
A5M34ELE	<b>Electronics</b>	KZ	4	3P+1L	L	PV
125ESBB	<b>Building Energy Systems 1</b> <i>Ilona Koubková</i>	ZK	4	2P	Z	PV
2162700	<b>Experimental Methods 1</b> <i>Miroslav Kuera Miroslav Kuera Miroslav Kuera (Gar.)</i>	KZ	4	0P+4L	*	PV
A5M16FIP	<b>Corporate finance</b>	KZ	4	3P+1C	L	PV
A5M13FVS	<b>Photovoltaic Systems</b> <i>Jakub Holovský, Ladislava erná, Vít zslav Benda Jakub Holovský Jakub Holovský (Gar.)</i>	KZ	4	3P+1L	Z	PV
A5M33IZS	<b>Information and Knowledge-Based Systems</b>	Z,ZK	4	2P+1C	L	PV
124INBB	<b>Integrated Design of Buildings</b> <i>Petr Hájek, Antonín Lupíšek Antonín Lupíšek Petr Hájek (Gar.)</i>	Z,ZK	4	2P+1C		PV
A5M38MEB	<b>Measurements in the Buildings</b> <i>Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)</i>	KZ	4	2P+1L	Z	PV
A5M35MAS	<b>Modeling and simulation</b>	KZ	4	2P+2C	Z	PV
125MEC	<b>Simulation of Building Energy Performance</b> <i>Hana Kabrhelová</i>	KZ	4	1P+1C	Z	PV
A5M13NZZ	<b>Independent sources</b> <i>Václav Papež Václav Papež Václav Papež (Gar.)</i>	KZ	4	3P+1L	Z	PV
125OZEB	<b>Renewable Energy Sources</b> <i>Karel Kabele, Hana Kabrhelová, Stanislav Frolík, Ilona Koubková, Michal Kabrhel Hana Kabrhelová Michal Kabrhel (Gar.)</i>	ZK	4	2P	L	PV
125PBZB	<b>Fire Services</b> <i>Hana Kabrhelová</i>	KZ	4	2P	L	PV
A5M38SPD	<b>Collection and data transfer</b> <i>Pavel Mlejnek</i>	KZ	4	3P+1L	L	PV
2162064	<b>Noise and Vibration Control</b> <i>Miroslav Kuera, Richard Nový Miroslav Kuera Miroslav Kuera (Gar.)</i>	KZ	4	2P+1C	*	PV
124ST2	<b>Thermal Engineering 2</b> <i>Jan Tywoniak</i>	KZ	4	2P		PV
125SYB	<b>Building Systems</b> <i>Jan Tywoniak, Karel Kabele, Hana Kabrhelová, Stanislav Frolík Hana Kabrhelová Karel Kabele (Gar.)</i>	ZK	4	4P	Z	PV
125TECE	<b>Technological Units</b> <i>Karel Kabele, Hana Kabrhelová, Stanislav Frolík, Ilona Koubková Hana Kabrhelová Ilona Koubková (Gar.)</i>	KZ	4	2P	Z	PV
B5M99SCT	<b>Technology for Smart Cities</b> <i>Lukáš Ferkl Lukáš Ferkl Lukáš Ferkl (Gar.)</i>	Z,ZK	4	2P+1C	Z	PV
2162114	<b>Heating</b> <i>Jiří Bašta</i>	KZ	4	2P+1C	*	PV
2162115	<b>Ventilation and Air Conditioning</b> <i>Vladimír Zmrhal</i>	KZ	4	2P+1C	*	PV
A5M14ZSE	<b>Fundamentals of Power Electrical Engineering</b>	KZ	4	2+1L	L	PV
2152038	<b>Energy Sources and Conversions</b>	KZ	4	3P+1C	*	PV

#### Characteristics of the courses of this group of Study Plan: Code=MIBPVP Name=Compulsory optionally subjects

A5M02AKA	Acoustic Applications	KZ	4
Lecture summarize applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.			
2162035	Alternative Energy Sources	KZ	4
Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.			
A5M17BUP	Biological Effects of Electromagnetic Field	KZ	4
Biophysical Aspects of Electromagnetic Fields (EF) coupling of Various Biological Systems (BS). Interaction of EF with BS - overview. Mechanism of Interaction and Biological Effects. Experimental Results and Hypotheses of Biological Effects of Static and Stationary Electrical, Magnetic and Nonstationary Fields. Mathematical Solution of Interaction. EF generated by living Organism. Applications of EF in Medicine. Hygienic Standards.			
2152060	Refrigeration Technique and Heat Pumps for Intelligent Buildings	KZ	4
A5M16EUE	Economics of Energy Use	KZ	4
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.			
A5M15ES1	Electrical Light 1	KZ	4
A5M38BEM	Electromagnetic compatibility	KZ	4
A5M34EZS	Electronic security systems	KZ	4
A5M34ELE	Electronics	KZ	4

125ESBB	Building Energy Systems 1 Analysis and concept of building energy systems, focused on building energy distribution - water and steam heating systems, hot water generation.	ZK	4
2162700	Experimental Methods 1 Introduction study of experimental technique in environmental engineering	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
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
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
124INBB	Integrated Design of Buildings	Z,ZK	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
A5M35MAS	Modeling and simulation	KZ	4
125MEC	Simulation of Building Energy Performance Introductory course for modelling and simulation of building energy performance.	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
125OZEB	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 proper way to design facilities and systems that use renewable energy sources.	ZK	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
A5M38SPD	Collection and data transfer	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
124ST2	Thermal Engineering 2	KZ	4
125SYB	Building Systems	ZK	4
125TECE	Technological Units Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.	KZ	4
B5M99SCT	Technology for Smart Cities	Z,ZK	4
2162114	Heating Supplemented knowledge from heating of residential and industrial buildings. Designing of convective and radiant heating systems.	KZ	4
2162115	Ventilation and Air Conditioning Main principles of ventilation and air conditioning. Source materials for design of systems. Natural ventilation, forced ventilation, air conditioning systems - output (capacity) and operation.	KZ	4
A5M14ZSE	Fundamentals of Power Electrical Engineering	KZ	4
2152038	Energy Sources and Conversions	KZ	4

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

Code of the group: MIBVOLPRE

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

~Nabídka volitelných předmětů uspořádaných podle kateder najdete na webových stránkách <http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>



## 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
124ST2	Thermal Engineering 2	KZ	4
125EABI	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.			
125ESBB	Building Energy Systems 1	ZK	4
Analysis and concept of building energy systems, focused on building energy distribution - water and steam heating systems, hot water generation.			
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 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 proper way to design facilities and systems that use renewable energy sources.			
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.			
2152038	Energy Sources and Conversions	KZ	4
2152060	Refrigeration Technique and Heat Pumps for Intelligent Buildings	KZ	4
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.			
2161110	Air Conditioning and Industrial Ventilation	Z,ZK	4
Main functional elements of ventilation and air conditioning systems. Air conditioning systems. Ventilation systems for residential and technological rooms.			
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.			
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.			
2162114	Heating	KZ	4
Supplemented knowledge from heating of residential and industrial buildings. Designing of convective and radiant heating systems.			
2162115	Ventilation and Air Conditioning	KZ	4
Main principles of ventilation and air conditioning. Source materials for design of systems. Natural ventilation, forced ventilation, air conditioning systems - output (capacity)and operation.			
2162700	Experimental Methods 1	KZ	4
Introduction study of experimental technique in environmental engineering			
2163033	Design IB I.	Z	6
Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.			
2163034	Project IB II.	Z	6
Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.			

A5M02AKA	Acoustic Applications	KZ	4
Lecture summarizing applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.			
A5M13FVS	Photovoltaic Systems	KZ	4
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.			
A5M13NZZ	Independent sources	KZ	4
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.			
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5
A5M14ZSE	Fundamentals of Power Electrical Engineering	KZ	4
A5M15ES1	Electrical Light 1	KZ	4
A5M16EUE	Economics of Energy Use	KZ	4
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.			
A5M17BUP	Biological Effects of Electromagnetic Field	KZ	4
Biophysical Aspects of Electromagnetic Fields (EF) coupling of Various Biological Systems (BS). Interaction of EF with BS - overview. Mechanism of Interaction and Biological Effects. Experimental Results and Hypotheses of Biological Effects of Static and Stationary Electrical, Magnetic and Nonstationary Fields. Mathematical Solution of Interaction. EF generated by living Organism. Applications of EF in Medicine. Hygienic Standards.			
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.			
A5M34ELE	Electronics	KZ	4
A5M34EZS	Electronic security systems	KZ	4
A5M35MAS	Modeling and simulation	KZ	4
A5M38BEM	Electromagnetic compatibility	KZ	4
A5M38MEB	Measurements in the Buildings	KZ	4
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.			
A5M38SPD	Collection and data transfer	KZ	4
A5M38SZS	Sensors and Networks	Z,ZK	4
Applications of sensors in buildings			
A5M99DIP	Diploma Thesis	Z	26
A5M99PR1	Project 1	Z	6
The topic of the thesis is chosen by the student and selected from the list of topics. "Project 1" is followed by "Project 2" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.			
A5M99PR2	Project 2	Z	6
The topic of the thesis is chosen by the student and selected from the list of topics. Project 2 mostly follows the topic of "Project 1" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.			
ADIP26	Diploma Thesis	Z	26
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
B5M99SCT	Technology for Smart Cities	Z,ZK	4
BEZM	Safety in Electrical Engineering for a master's degree	Z	0
The course provides for students of all programs periodic training guidelines for health and occupational safety and gives knowledge of electrical hazard of given branch of study. Students receive indispensable qualification according to the current Directive of the Dean.			

For updated information see <http://bilakniha.cvut.cz/en/f3.html>

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