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	**Safety in Electrical Engineering for a master´s degree** *Vladimír Kůla, Radek Havlíček, Ivana Nová, Josef Černohous, Pavel Mlejnek* ***Radek Havlíček*** *Vladimír Kůla (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	**Diploma Thesis** ***Petr Kašpar***	Z	26	0P+20C	L	P
ADIP26	**Diploma Thesis**	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 programm

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)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
124OSIB	**Acoustics and Lighting** *Jaroslav Vychytil, Lenka Maierová* ***Jaroslav Vychytil*** *Jaroslav Vychytil (Gar.)*	KZ	4	2P	Z	P
125ESB	**Buildings Ecology Systems** *Stanislav Frolík* ***Stanislav Frolík*** *Stanislav Frolík (Gar.)*	KZ	4	2P	L	P
125EABI	**Energy Audit of Building** ***Hana Kabrhelová***	KZ	4	2P	L	P
124KPKP	**Building Structures** *Ctislav Fiala* ***Ctislav Fiala*** *Ctislav Fiala (Gar.)*	ZK	4	3P	Z	P
2161108	**Transport Phenomena** *Martin Barták* ***Martin Barták*** *Martin Barták (Gar.)*	Z,ZK	4	2P+1C	*	P
2161109	**Automatic control in environmental engineering of building** *Jiří Bašta, Jindřich Boháč* ***Jiří Bašta*** *Jiří Bašta (Gar.)*	Z,ZK	4	2P+1C	*	P
A5M14RPI	**Distribution of Electric Energy and Drives** *Jiří Lettl, Pavel Mindl, Jan Bauer* ***Jiří Lettl*** *Jiří Lettl (Gar.)*	Z,ZK	5	2P+1L	Z	P
2161102	**Radiant and Industrial Heating** *Jiří Bašta, Roman Vavřička* ***Jiří Bašta*** *Jiří Bašta (Gar.)*	Z,ZK	4	2P+1C	*	P
A5M38SZS	**Sensors and Networks** *Pavel Ripka, Antonín Platil* ***Antonín Platil*** *Pavel Ripka (Gar.)*	Z,ZK	4	2P+1L	L	P
124ST1	**Thermal Engineering in Construction** *Jan Tywoniak* ***Jan Tywoniak*** *Jan Tywoniak (Gar.)*	ZK	5	2P	Z	P
2161567	**Ventilation and Air Conditioning** *Vladimír Zmrhal, Petr Zelenský* ***Vladimír Zmrhal*** *Vladimír Zmrhal (Gar.)*	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

124OSIB	Acoustics and Lighting	KZ	4
The course introduces students to the basics of building lighting technology and building acoustics and deepens further knowledge.			
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.			
124KPKP	Building Structures	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.			
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	ZK	5
The subject discusses the basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of providing basic information to students coming from non-construction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from civil engineering.			
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	**Design IB I.** *Martin Barták, Jiří Bašta, Jindřich Boháč, Roman Vavřička, Vladimír Zmrhal, Petr Zelenský, Jiří Hemerka, Miroslav Kučera, Miloš Lain, ...* ***Jiří Bašta*** *Jiří Bašta (Gar.)*	Z	6	0P+4C	*	P
125PIB1	**Project 1** *Stanislav Frolík, Zuzana Veverková, Ilona Koubková, Michal Kabrhel, Karel Kabele, Bohumír Garlík, Daniel Adamovský, Miroslav Urban, Pavla Hofbauer Pechová, ...* ***Stanislav Frolík*** *Michal Kabrhel (Gar.)*	Z	6	4C	L	P
A5M99PR1	**Project 1** ***Petr Kašpar*** *Petr Kašpar (Gar.)*	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.	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.			
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 knowledge from the Bachelor'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 thorough analysis of the current state of the art from the literature.			
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.			

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	**Project IB II.** ***Jiří Bašta*** *Jiří Bašta (Gar.)*	Z	6	0P+4C	*	P
125PIB2	**Project 2** ***Michal Kabrhel*** *Michal Kabrhel (Gar.)*	Z	6	4C	Z	P
A5M99PR2	**Project 2** ***Petr Kašpar*** *Petr Kašpar (Gar.)*	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.	Z	6
Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.			
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 advanced project in the field of intelligent buildings.			
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.			

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	**Acoustic Applications** *Ondřej Jiříček **Ondřej Jiříček** Ondřej Jiříček (Gar.)*	KZ	4	2P+2L	L	PV
2162035	**Alternative Energy Sources** *Tomáš Matuška **Tomáš Matuška** Tomáš Matuška (Gar.)*	KZ	4	2P+1C	*	PV
A5M17BUP	**Biological Effects of Electromagnetic Field** *Jan Vrba, Ladislav Oppl **Jan Vrba** Jan Vrba (Gar.)*	KZ	4	2P+2L	L	PV
2152060	**Refrigeration Technique and Heat Pumps for Intelligent Buildings**	KZ	4	3P+1C	*	PV
A5M16EUE	**Economics of Energy Use** *Jiří Beranovský, Július Bemš **Jiří Beranovský** Július Bemš (Gar.)*	KZ	4	3P+1C	Z	PV
A5M15ES1	**Electrical Light 1** *Petr Žák, Petr Žák **Petr Žák** Petr Žák (Gar.)*	KZ	4	2P+1S	Z	PV
A5M38BEM	**Electromagnetic compatibility**	KZ	4	1P+1L	Z	PV
A5M34EZS	**Electronic security systems** *Miroslav Husák, Jan Novák, Tomáš Teplý, Václav Prajzler **Václav Prajzler** Václav Prajzler (Gar.)*	KZ	4	3P+1L	Z	PV
A5M34ELE	**Electronics** *Alexandr Laposa, Adam Bouřa **Alexandr Laposa** Alexandr Laposa (Gar.)*	KZ	4	3P+1L	L	PV
2162700	**Experimental Methods 1** *Miroslav Kučera **Miroslav Kučera** Miroslav Kučera (Gar.)*	KZ	4	0P+4L	*	PV
A5M16FIP	**Corporate finance** *Oldřich Starý, Jiří Vašíček, Blanka Kučerková **Jiří Vašíček** Oldřich Starý (Gar.)*	KZ	4	3P+1C	L	PV
A5M13FVS	**Photovoltaic Systems** *Pavel Hrzina, Ladislava Černá, Vítězslav Benda **Ladislava Černá** Pavel Hrzina (Gar.)*	KZ	4	2P+2L	L	PV
A5M33IZS	**Information and Knowledge-Based Systems**	Z,ZK	4	2P+1C	L	PV
124INBB	**Integrated Design of Buildings** *Jan Růžička, Petr Hájek, Antonín Lupíšek **Antonín Lupíšek** Petr Hájek (Gar.)*	Z,ZK	4	2P+1C	Z	PV
A5M38MEB	**Measurements in the Buildings** *Petr Kašpar **Petr Kašpar** Petr Kašpar (Gar.)*	KZ	4	2P+1L	Z	PV
A5M35MAS	**Modeling and simulation**	KZ	4	2P+2C	Z	PV
125MEC	**Simulation of Building Energy Performance** *Karel Kabele, Miroslav Urban **Karel Kabele** Karel Kabele (Gar.)*	KZ	4	1P+1C	Z	PV
A5M13NZZ	**Independent sources** *Pavel Hrzina, Václav Papež **Pavel Hrzina** Pavel Hrzina (Gar.)*	KZ	4	3P+1L	Z	PV
125OZEB	**Renewable Energy Sources** *Michal Kabrhel **Michal Kabrhel** Michal Kabrhel (Gar.)*	ZK	4	2P	Z	PV
125PBZB	**Fire Services** *Ilona Koubková, Bohumír Garlík, Daniel Adamovský, Pavla Hofbauer Pechová **Ilona Koubková** Ilona Koubková (Gar.)*	KZ	4	2P	L	PV
A5M38SPD	**Collection and data transfer** ***Pavel Mlejnek***	KZ	4	3P+1L	L	PV
2162064	**Noise and Vibration Control** *Miroslav Kučera, Richard Nový **Miroslav Kučera** Miroslav Kučera (Gar.)*	KZ	4	2P+1C	*	PV
125SYB	**Building Systems** *Jan Tywoniak, Karel Kabele **Karel Kabele** Karel Kabele (Gar.)*	ZK	4	4P	Z	PV
125TECE	**Technological Units** *Ilona Koubková, Hana Kabrhelová **Ilona Koubková** Ilona Koubková (Gar.)*	KZ	4	2P	Z	PV
B5M99SCT	**Technology for Smart Cities** *Lukáš Ferkl **Lukáš Ferkl** Lukáš Ferkl (Gar.)*	Z,ZK	4	2P+1C	Z	PV
A5M14ZSE	**Fundamentals of Power Electrical Engineering**	KZ	4	2+1L	L	PV
2152038	**Energy Sources and Conversions**	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
2162700	Experimental Methods 1	KZ	4
Introduction study of experimental technique in environmental engineering			
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.			
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.			
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 reqiremnts 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.			
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 assessment of buildings, evaluation of building performance, green/sustainable certification systems and understand environmental, social and economic aspects of the built environment.			
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.			
A5M35MAS	Modeling and simulation	KZ	4
125MEC	Simulation of Building Energy Performance	KZ	4
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.			
A5M13NZZ	Independent sources	KZ	4
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.			
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 correct 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.			
A5M38SPD	Collection and data transfer	KZ	4
2162064	Noise and Vibration Control	KZ	4
Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.			
125SYB	Building Systems	ZK	4
Multi-criteria analysis of the requirements for the indoor environment and the function of the systems in different types of buildings and plants and optimization criteria for the design of energy and ecological building systems. Relationships between building technical equipment and the building. Integrated view of conceptual solutions in different building types in terms of indoor systems and building design. E.g. office buildings, residential buildings, halls, shopping centres, cultural centres, industrial buildings, sports buildings, family houses, passive etc. The audience will be introduced to the requirements for the indoor environment, the characteristic elements of energy and environmental building systems in relation to the structural design for the building type.			
125TECE	Technological Units	KZ	4
Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.			
B5M99SCT	Technology for Smart Cities	Z,ZK	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: ~Nabídku 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
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.			
124KPKP	Building Structures	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.			
124OSIB	Acoustics and Lighting	KZ	4
The course introduces students to the basics of building lighting technology and building acoustics and deepens further knowledge.			
124ST1	Thermal Engineering in Construction	ZK	5
The subject discusses the basic chapters of building physics - part hygrothermal performance of buildings in an overview manner with the aim of providing basic information to students coming from non-construction bachelor's fields and at the same time supplementing knowledge and linking it with contexts for students coming from civil engineering.			
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.			
125MEC	Simulation of Building Energy Performance	KZ	4
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.			
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 correct 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
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 knowledge from the Bachelor'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 thorough analysis of the current state of the art from the literature.			
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 advanced project in the field of intelligent buildings.			
125SYB	Building Systems	ZK	4
Multi-criteria analysis of the requirements for the indoor environment and the function of the systems in different types of buildings and plants and optimization criteria for the design of energy and ecological building systems. Relationships between building technical equipment and the building. Integrated view of conceptual solutions in different building types in terms of indoor systems and building design. E.g. office buildings, residential buildings, halls, shopping centres, cultural centres, industrial buildings, sports buildings, family houses, passive etc. The audience will be introduced to the requirements for the indoor environment, the characteristic elements of energy and environmental building systems in relation to the structural design for the building type.			
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.			
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.			

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 summarize 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. Uninteruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical enegy, 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 reqiremnts 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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