

# Recommended pass through the study plan

## Name of the pass: Intelligent Buildings - valid from 2020

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Pass through the study plan: Inteligentní budovy - platný od roku 2020

Branch of study guaranteed by the department: Welcome page

Guarantor of the study branch:

Program of study: Intelligent Buildings

Type of study: Follow-up master full-time

Note on the pass:

Coding of roles of courses and groups of courses:

P - compulsory courses of the program, PO - compulsory courses of the branch, Z - compulsory courses, S - compulsory elective courses, PV - compulsory elective courses, F - elective specialized courses, V - elective courses, T - physical training courses

Coding of ways of completion of courses (KZ/Z/ZK) and coding of semesters (Z/L):

KZ - graded assesment, Z - assesment, ZK - examination, L - summer semester, Z - winter semester

Number of semester: 1

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, <b>authors</b> 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, Pavel Mlejnek <b>Radek Havlí ek</b> Vladimír K la (Gar.)	Z	0	2BP+2BC	Z	P
124KPKP	<b>Building Structures - Final Review</b> Ctislav Fiala <b>Ctislav Fiala</b> Ctislav Fiala (Gar.)	ZK	4	3P	Z	P
124OSIB	<b>Lighting and Acoustics</b> Jaroslav Vychytil, Lenka Maierová <b>Jaroslav Vychytil</b> Jaroslav Vychytil (Gar.)	KZ	4	2P	Z	P
2161108	<b>Transport Phenomena</b> Martin Barták <b>Martin Barták</b> Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	P
A5M14RPI	<b>Distribution of Electric Energy and Drives</b> Ji í Lettl, Pavel Mindl, Jan Bauer <b>Ji í Lettl</b> Ji í Lettl (Gar.)	Z,ZK	5	2P+1L	Z	P
124ST1	<b>Thermal Engineering in Construction 1</b> Jan Tywoniak <b>Jan Tywoniak</b> Jan Tywoniak (Gar.)	ZK	5	2P	Z	P
2020_MIBPV	<b>Povinn volitelné p edm ty programu</b> 2162035,2151154,..... (see the list of groups below)	Min. cours. 8 Max. cours. 23	Min/Max 32/92			PV

Number of semester: 2

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, <b>authors</b> and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
125ESB	<b>Buildings Ecology Systems</b> Stanislav Frolík <b>Stanislav Frolík</b> Stanislav Frolík (Gar.)	KZ	4	2P	L	P
125EABU	<b>Energy Audit of Building</b> Karel Kabele, Miroslav Urban, Michal Kabrhel <b>Karel Kabele</b> Karel Kabele (Gar.)	KZ	4	2P+1C	L	P
2161109	<b>Automatic control in environmental engineering of building</b> Ji í Bašta, Jind ich Bohá <b>Ji í Bašta</b> Ji í Bašta (Gar.)	Z,ZK	4	2P+1C	*	P
A5M38SZS	<b>Sensors and Networks</b> Pavel Ripka, Antonín Platil <b>Antonín Platil</b> Pavel Ripka (Gar.)	Z,ZK	4	2P+1L	L	P
2161567	<b>Ventilation and Air Conditioning</b> Vladimír Zmrhal, Miloš Lain <b>Vladimír Zmrhal</b> Vladimír Zmrhal (Gar.)	Z,ZK	4	2P+1C	2	P
2020_MIBPRO1	<b>Projekt 1</b> 2163033,125PIB1,..... (see the list of groups below)	Min. cours. 1 Max. cours. 1	Min/Max 6/6			P
2020_MIBPV	<b>Povinn volitelné p edm ty programu</b> 2162035,2151154,..... (see the list of groups below)	Min. cours. 8	Min/Max 32/92			PV

		Max. cours. 23				
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Number of semester: 3

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, <b>authors</b> and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
2161102	<b>Radiant and Industrial Heating</b> <i>Ji í Bašta, Jind ich Bohá Ji í Bašta Ji í Bašta (Gar.)</i>	Z,ZK	4	2P+1C	*	P
B5M99SCT	<b>Technology for Smart Cities</b> <i>Lukáš Ferkl <b>Lukáš Ferkl</b> Lukáš Ferkl (Gar.)</i>	Z,ZK	4	2P+1C	Z	P
2020_MIBPRO2	<b>Projekt 2</b> <i>2163034,125PIB2,..... (see the list of groups below)</i>	Min. cours. 1 Max. cours. 1	Min/Max 6/6			P
2020_MIBPV	<b>Povinn volitelné p edm ty programu</b> <i>2162035,2151154,..... (see the list of groups below)</i>	Min. cours. 8 Max. cours. 23	Min/Max 32/92			PV

Number of semester: 4

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, <b>authors</b> and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
ADIP26	<b>Diploma Thesis</b>	Z	26	36s	L	P
2020_MIBPV	<b>Povinn volitelné p edm ty programu</b> <i>2162035,2151154,..... (see the list of groups below)</i>	Min. cours. 8 Max. cours. 23	Min/Max 32/92			PV

### List of groups of courses of this pass with the complete content of members of individual groups

Kód	Name of the group of courses and codes of members of this group (for specification see here or below the list of courses)			Completion	Credits	Scope	Semester	Role
<b>2020_MIBPRO1</b>	<b>Projekt 1</b>			Min. cours. 1 Max. cours. 1	Min/Max 6/6			P
2163033	Design IB I.	125PIB1	Project 1	A5M99PR1	Project 1			
<b>2020_MIBPRO2</b>	<b>Projekt 2</b>			Min. cours. 1 Max. cours. 1	Min/Max 6/6			P
2163034	Project IB II.	125PIB2	Project 2	A5M99PR2	Project 2			
<b>2020_MIBPV</b>	<b>Povinn volitelné p edm ty programu</b>			Min. cours. 8 Max. cours. 23	Min/Max 32/92			PV
2162035	Alternative Energy Sources	2151154	Refrigeration and heat pumps	A5M16EUE	Economics of Energy Use			
A5M15ES1	Electrical Light 1	A5M34EZE	Electronic security systems	A5M34ELE	Electronics			
125EIBB	Electroengineering and intellige ...	2162700	Experimental Methods 1	A5M16FIP	Corporate finance			
A5M13FVS	Photovoltaic Systems	124INBB	Integrated Design of Buildings	A5M38MEB	Measurements in the Buildings			
125MEC	Simulation of Building Energy Pe ...	A5M13NZZ	Independent sources	125OZEB	Renewable Energy Sources			
125PBZB	Fire Services	2162019	Industrial Heating, Ventilation, ...	A5M38SBD	Collection and Data Transfer			

2162064	Noise and Vibration Control	125SYB	Building Systems	125TECE	Technological Units
2162113	Heating	2162066	Heat Supply		

### List of courses of this pass:

Code	Name of the course	Completion	Credits
124INBB	<b>Integrated Design of Buildings</b> 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.	Z,ZK	4
124KPKP	<b>Building Structures - Final Review</b> Basics of building structures. Functional requirements, structural systems, spatial effect of the structural system. Vertical load-bearing structures, floor structures, overhanging structures. Envelopes of buildings, windows, partitions, floors, suspended ceilings. Stairs, roof construction – timber roof trusses, roof envelopes. Foundation structures, structural solution of the substructure, waterproofing of the substructure. Structural systems of single and multi-storey buildings, structural systems of long-span structures.	ZK	4
124OSIB	<b>Lighting and Acoustics</b> The course introduces students to the basics of building lighting technology and building acoustics and deepens further knowledge.	KZ	4
124ST1	<b>Thermal Engineering in Construction 1</b> 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.	ZK	5
125EABU	<b>Energy Audit of Building</b> 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.	KZ	4
125EIBB	<b>Electroengineering and intelligent buildings</b> The information society, intelligent systems, new technologies significantly influence various HVAC system applications. The fundamental idea is to save energy, materials and ensure optimal indoor and outdoor environmental parameters. The influence of electromagnetic environment, electromagnetic compatibility, application of intelligent devices in buildings requires a system approach to solve the whole complex of HVAC and intelligent wiring.	KZ	4
125ESB	<b>Buildings Ecology Systems</b> 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.	KZ	4
125MEC	<b>Simulation of Building Energy Performance</b> 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.	KZ	4
125OZEB	<b>Renewable Energy Sources</b> 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.	ZK	4
125PBZB	<b>Fire Services</b> 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
125PIB1	<b>Project 1</b> 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.	Z	6
125PIB2	<b>Project 2</b> 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.	Z	6
125SYB	<b>Building Systems</b> 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.	ZK	4
125TECE	<b>Technological Units</b> Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.	KZ	4
2151154	<b>Refrigeration and heat pumps</b> 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 <sub>2</sub> O - basic form, basic processes. • Heat pumps: heating and hot tap water. • Heat sources for HP	KZ	4
2161102	<b>Radiant and Industrial Heating</b> Student will be informed about the basics of radiant and other industrial heating systems	Z,ZK	4

2161108	<b>Transport Phenomena</b> Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment.	Z,ZK	4
2161109	<b>Automatic control in environmental engineering of building</b> Application of basic approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and sources of heat.	Z,ZK	4
2161567	<b>Ventilation and Air Conditioning</b> 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.	Z,ZK	4
2162019	<b>Industrial Heating, Ventilation, Airconditioning</b> Design and functional properties of ventilation systems for technological premises. Heat and mass transfer, aerodynamics calculation. Energy demands of systems.	KZ	4
2162035	<b>Alternative Energy Sources</b> Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.	KZ	4
2162064	<b>Noise and Vibration Control</b> Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.	KZ	4
2162066	<b>Heat Supply</b> 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	<b>Heating</b> Knowledge improvement from the field of heating of residential and industrial buildings. Designing of convective and radiant heating systems.	KZ	4
2162700	<b>Experimental Methods 1</b> Introduction study of experimental technique in environmental engineering	KZ	4
2163033	<b>Design IB I.</b> 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
2163034	<b>Project IB II.</b> Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.	Z	6
A5M13FVS	<b>Photovoltaic Systems</b> 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	<b>Independent sources</b> 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	<b>Distribution of Electric Energy and Drives</b>	Z,ZK	5
A5M15ES1	<b>Electrical Light 1</b>	KZ	4
A5M16EUE	<b>Economics of Energy Use</b> 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	<b>Corporate finance</b> 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
A5M34ELE	<b>Electronics</b>	KZ	4
A5M34EVS	<b>Electronic security systems</b>	KZ	4
A5M38MEB	<b>Measurements in the Buildings</b> 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	<b>Collection and Data Transfer</b>	KZ	4
A5M38SZS	<b>Sensors and Networks</b> Applications of sensors in buildings	Z,ZK	4
A5M99PR1	<b>Project 1</b> 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
A5M99PR2	<b>Project 2</b> 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
ADIP26	<b>Diploma Thesis</b> 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.	Z	26
B5M99SCT	<b>Technology for Smart Cities</b>	Z,ZK	4
BEZM	<b>Safety in Electrical Engineering for a master's degree</b> 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.	Z	0

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

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