COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6"></td><td colspan="2">Degree level and programme type</td><td></td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td>Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Building physics</td><td colspan="2">Course code</td><td>IS-FCEE-00019W</td></tr>
<tr><td colspan="2">Course type</td><td>Erasmus</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>winter</td></tr>
<tr><td>30</td><td></td><td>15</td><td>15</td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>5</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Selected areas of physics, architecture, building materials</td></tr>
<tr><td>Course objectives</td><td colspan="9">Principles of heat transfer through the building envelope. Requirements of thermal protection of buildings. Air filtration through building envelopes. Thermal comfort of rooms. Thermal balance of buildings. Energy rating of heated buildings. Moisture in building materials and building elements. Principles of design and execution of external building elements to avoid excessive moisture content. Basic information of building acoustics. Acoustical protection of rooms. Acoustical properties of building elements. Basic information of light technics. Characteristics of daylight and artificial light. Determination of coefficient of daylight by different types of lighting. Measuring physical values and interpretation of the results</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: Understanding the physical processes and phenomena taking place inside buildings. Shaping the ability of describing the basic thermal parameters of the heat and humidity of buildings. Familiarizing with the requirements for the thermal protection of heated buildings. Energy rating of heated buildings. The humidity level of constructional baffles. The rules of designing and making outer constructional baffles to avoid overmuch humidity. Anti-sound protection of the rooms. The acoustic features of constructional baffles. Evaluation of room lighting.
Laboratory classes: Carrying out measurements on: determination of the thermal conductivity for building materials, determination of room lighting parameters, determination of heat transfer coefficient U of buildings, determination of comfort indicators in buildings, sound level measurement and noise frequency analysis, thermography - detecting weak spots in buildings.
Project: Determination of thermal characteristics of building envelope. Determination of basic energy characteristics of an exemplary building with an assessment of the energy standard of the analyzed building. Assessment of moisture condensation risk in the external wall of the analyzed building.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">multimedia presentations, project presentation and discussion; discussion of the measurements</td></tr>
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Assessment method	lecture - written exam, laboratory classes - evaluation of reports, project - project completion	
Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	the graduate student knows and understands the basics of building physics and understands the phenomena connected with heat transfer and humidity movement in building structures	K_B1_W01 K_B1_W07
LO2	knows the basic principles of air filtration in buildings	K_B1_W01 K_B1_W07 K_B1_U07
LO3	knows the rules for calculating and measurements of basic physical quantities; can select the tools for measuring physical parameters and use them	K_B1_W07 K_B1_U07 K_B1_K01
LO4	can calculate physical parameters and interpret their results, can perform and assess the energy performance of a building	K_B1_W01 K_B1_W01 K_B1_U07
LO5	can assess the thermal comfort in rooms based on PMV and PPD indicators, can determine the acoustic features of structural partitions and lighting in rooms	K_B1_W01 K_B1_U02 K_B1_U07 K_B1_K04
LO6	able to design the outer partition to avoid internal moisture	K_B1_W01 K_B1_U07
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	written and oral evaluation	L, LC, P
LO2	written and oral evaluation	L, P
LO3	written and oral evaluation; project completion and defence; evaluation of reports	L, LC, P
LO4	project completion and defence	P
LO5	evaluation of reports	L, LC
LO6	written and oral evaluation; project completion	L, P
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	30
	participation in classes, laboratory classes, etc	30
	performing design tasks at home	30
	participation in student-teacher sessions related to the classes/project	20
	preparation for the exam / test	20
	preparation to the project classes	20
	TOTAL:	**150**

Quantitative indicators		HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation		30+30+15	3
Student workload – practical activities		30+20+20+20	3
Basic references	1. "Introduction to Building Physics", Prof Carl-Eric Hagentoft, Chalmers University of Technology, Sweden, 2001 2. "Building Physics -- Heat, Air and Moisture: Fundamentals and Engineering Methods with Examples and Exercises", Hens, Hugo S. L. C., 2013 3. Lienhard J.H., "A heat transfer textbook" Phlogiston Press (https://www.emse.fr/~bonnefoy/Public/MFTBibliography/Heat%20transfers%20by%20Lienhard.pdf)		
Supplementary references	1. Markiewicz-Zahorski Przemysław, "Building construction, solution & details for professionals", Polygraphy Department of the Cracow University of Technology, 2019 2. National standards: EN ISO 10456; EN ISO 6946; EN ISO 13788; PN-EN ISO 7730 3. Technical requirements for buildings (https://epbd-ca.eu/ca-outcomes/outcomes-2015-2018)		
Organisational unit conducting the course	**Department of Energy-Efficient Construction and Geodesy**	**Date of issuing the programme**	
Author of the programme	**Beata Sadowska, PhD, Eng.**	**05.03.2020**	

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar