

## COURSE DESCRIPTION CARD – MODULE 2

<b>Field of study</b>	International Interdisciplinary Summer School "Energy-efficient construction, users and environment friendly"					<b>Programme type</b>	Summer course
<b>Module name</b>	Modern materials in construction					<b>Course code</b>	IISS2026-M2
						<b>Course type</b>	obligatory
<b>Forms and number of hours of tuition</b>	<b>L</b>	<b>LC</b>	<b>P</b>	<b>SW</b>	<b>FW</b>	<b>Language</b>	English
	1			7			
<b>Course objectives</b>	Ability to properly design building structures, taking into account contemporary trends in construction technologies. Ability to select material solutions of the individual building envelopes using modern construction materials taking into account climatic conditions. Ability to assess the thermal quality of the building envelope. Ability to apply critical thinking for analyzing issues related to sustainable construction, selection of structural solutions and building materials considering the impact on the natural environment. Knowledge of requirements and regulations related to the thermal protection of buildings.						
<b>Course content</b>	<p>Overview of the basic rules and guidelines for the design of sustainable building structures and their elements.</p> <p>Presentation of the modern solutions, construction technologies and materials and discussion about parameters influencing their selection, to meet thermal protection requirements.</p> <p>Presentation of various types of solutions for energy-efficient and passive single-family residential buildings.</p> <p>Overview of sustainability aspects in the construction sector. Life-cycle analysis of construction products and buildings. Discussion of carbon footprint assessment methods.</p> <p>Overview of the basic functions of the computer program for calculating the thermal quality of building partitions.</p> <p>Selection of material solutions for individual partitions of a single-family building, taking into account climatic conditions.</p> <p>Entering basic data regarding the materials used in the designed partitions.</p> <p>Performing calculations of the heat transfer coefficients of the individual building envelopes.</p> <p>Discussion and verification of the calculation results.</p> <p>Preparing final report.</p>						
<b>Teaching methods</b>	Lecture, workshop, carrying out a design work						
<b>Assessment method</b>	Design work defence, evaluation of final report.						
<b>Symbol of learning outcome</b>	<b>Learning outcomes</b>					<b>Reference to the learning outcomes for the field of study</b>	
<b>LO1</b>	The graduate knows and understands standards, rules and guidelines for the design of building structures and their elements taking into account the principles of sustainable development.					K_IISS_W01	

L02	The graduate knows and understands contemporary trends in sustainable construction technologies and their impact on the architectural form of buildings.	K_IISS_W06
L03	The graduate knows and understands influence of climatic conditions on the technical conditions of shaping the structural solutions and architecture of the building.	K_IISS_W07
L04	The graduate knows and understands the impact of material solutions used in buildings on the burden on the natural environment.	K_IISS_W08
L05	The graduate knows and understands basic methods of analysis and modeling of thermal-flow processes in buildings.	K_IISS_W09
L06	The graduate knows and understands assumptions of the method for calculating the carbon footprint of construction products and buildings using life cycle analysis.	K_IISS_W11
L07	The graduate is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and sustainable construction.	K_IISS_U02
L08	The graduate is able to properly use up-to-date information on innovations in environmental engineering/materials engineering/construction/ architecture/ lighting/ IoT technology.	K_IISS_U03
L09	The graduate is able to properly select the technical conditions for designing buildings in relation to climatic conditions in order to design selected building elements of the facility.	K_IISS_U06
L010	The graduate is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work.	K_IISS_K01
<b>Symbol of learning outcome</b>	<b>Methods of assessing the learning outcomes</b>	<b>Type of tuition during which the outcome is assessed</b>
L01	Defence of the completed project, test and final report.	SW
L02	Defence of the completed project.	SW
L03	Defence of the completed project.	SW
L04	Defence of the completed project, test and final report.	SW
L05	Defence of the completed project, test and final report.	SW
L06	Defence of the completed project.	SW
L07	Defence of the completed project, test and final report.	SW
L08	Defence of the completed project.	SW
L09	Defence of the completed project.	SW
L010	Defence of the completed project, test and final report.	SW
<b>Student workload (in hours)</b>		<b>No. of hours</b>
<b>Calculation</b>	Participation in the lecture.	1
	Participation in workshop.	7
	Preparation of the design and final report..	7
	Preparation for the final test.	3
	Consultation	2
	<b>TOTAL:</b>	<b>20</b>
<b>Quantitative indicators</b>		<b>HOURS</b>   <b>No. of</b>

		ECTS credits
<b>Student workload – activities that require direct teacher participation</b>		9 0,36
<b>Student workload – practical activities</b>		19 0,76
<b>Basic references</b>	<p>Building 2020+: Constructions, Materials and Installations. Ed. Dorota Anna Krawczyk. Printing House of Bialystok University of Technology. Bialystok –Córdoba-Vilnius 2019.</p> <p>Addington, M. &amp; Schodek, D. (2005) Smart Materials and New Technologies: For the Architecture and Design Professions. Harvard University.</p> <p>Grudzińska M. Ostańska A., Życzyńska A. "Low Energy and Passive Buildings". Medium. Warsaw, 2017.</p> <p>Markiewicz-Zahorski Przemysław, "Building construction, solution &amp; details for professionals", Polygraphy Department of the Cracow University of Technology, 2019.</p> <p>BPIE.; Staniaszek, D.; Firlag, Sz. Financing Building Energy Performance Improvement in Poland. Status Report. 2016. Available online: <a href="http://bpie.eu/wp-content/uploads/2016/01/BPIE_Financing-building-energy-in-Poland_EN.pdf">http://bpie.eu/wp-content/uploads/2016/01/BPIE_Financing-building-energy-in-Poland_EN.pdf</a></p> <p>Passive House Database: <a href="https://passivehouse-database.org/index.php?lang=en">https://passivehouse-database.org/index.php?lang=en</a></p> <p>Fuchsl S., Rheude F., Roder H. Life cycle assessment (LCA) of thermal insulation materials: A critical review, Cleaner Materials, 5, 2022.</p> <p>Aggarwal Ch., Moletti S., Ghobadi M. A Comprehensive Review of Life Cycle Assessment (LCA) Studies in Roofing Industry: Current Trends and Future Directions, Smart Cities, 7(5), 2024.</p>	
<b>Organisational unit conducting the course</b>	Department of Building Structures and Structural Mechanics, Department of Sustainable Construction and Building Systems, BUT, with participation of abroad expert	<b>Date of issuing the programme</b>
<b>Author of the programme</b>	prof. Marta Kosior-Kazberuk, prof. PB dr. Beata Sadowska prof. Lina Seduikyte, Lithuania	05.12.2025

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