GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics of Building Structures , PG_00043937		
Field of study	Civil Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Building Structures and Material Engineering -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Krzaczek	
	Teachers	dr inż. Jarosław Florczuk mgr inż. Sławomir Dobrowolski dr hab. inż. Marek Krzaczek	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	30	0.0	0.0	30

Subject objectives

Understanding the process of heat and mass transfer in building components and the calculation methods of criteria values (technical requirements) in the field of thermal insulation of building components and energy efficiency of buildings.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] Reads and prepares construction documentation (including drawings, graphic documentation in the CAD environment), efficiently uses maps as well as architectural, construction and geodetic drawings.	Ability todesign building components and their joints in terms of their thermal insulation.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W03] Demonstrate knowledge and understanding of the processes, established standards and design methods in the civil engineering subject area and of their limitations.	Basic knowledge of the nature of the heat and mass transfer process. Knowledge of methods for reducing the building's demand for thermal energy. Knowledge of renewable energy sources and methods of their use.	[SW2] Assessment of knowledge contained in presentation
[K6_U03] Design engineering objects and details, processes and engineering systems by applying appropriate standards and methods of design.	Knowledge of thermal insulation criteria and ability to calculate criteria values. Knowledge of the energy efficiency criterion and methods of calculating the amount of heat losses and gains in a building. Knowledge of the principles of designing thermal insulation elements of a building.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W04] Knows the rules of descriptive geometry and technical drawing for preparing and reading architectural, construction and geodetic drawings; also with the use of CAD	Ability to analyze an architectural design in terms of the solutions used regarding thermal insulation of construction components.	[SW2] Assessment of knowledge contained in presentation

Subject contents	The process of heat and mass transfer. Convective heat transfer. Radiative heat transfer. Thermal conductivity. General equation of thermal conductivity. Model of unidirectional and stationary heat conduction. Two-dimensional and stationary heat flow model. Thermal bridges. Mechanisms of moisture flow in building components. Relative air humidity. Condensation of water vapor in building components. Condensation of water vapor on the surfaces of building structure components. Thermal and humidity comfort conditions in the building. Renewable heat sources and methods of their use. Thermal insulation criteria. Methods for calculating thermal resistance, heat transfer coefficient, temperature distribution field and dew point temperature.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
colloquium - exercises	60.0%	50.0%
colloquium - lectures	60.0%	50.0%

Recommended reading	Basic literature	1. Bogosławski W.N.: Fizyka Budowli, Arkady, Warszawa 1975. 2. Pogorzelski J.A., : Fizyka budowli, podstawy wymiany ciepła i masy, Wydawnictwo Politechniki Białostockiej, Białystok, 1987. 3. Klemm P.: Budownictwo Ogólne. Fizyka Budowli, Tom 2, Arkady Warszawa, 2006.
	Supplementary literature	1. Mikoś J.:Budownictwo ekologiczne. Wydawnictwo Politechniki Śląskiej, Gliwice, 1996. 2. Staniszewski B.: Wymiana ciepła. Podstawy teoretyczne. PWN, Warszawa, 1980.
	eResources addresses	Adresy na platformie eNauczanie: FIZYKA BUDOWLI (ćwiczenia) 2023-2024 - Moodle ID: 34549 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34549
Example issues/ example questions/ tasks being completed	Test:1. The value of the solar air temperature can be:a) Lower than the air temperature measured with a dry bulb thermometer,b) Greater than the air temperature measured with a dry bulb thermometer,c) Equal to the air temperature measured with a dry bulb thermometer.2. In heat transfer by conduction, the heat flux density is:a) Proportional to the temperature gradient,b) Proportional to the thermal conductivity coefficient,c) It does not depend on temperature.3. The value of the heat flux density in a physical system in which heat exchange takes place by stationary and unidirectional conduction:a) It changes and depends on temperature,b) It changes and depends on the position in space,c) It is constant throughout the physical system.	
Work placement	Not applicable	