GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Building physics and acoustics, PG_00052802		
Field of study	Architecture		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	blended-learning
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Technical Fundamentals of Architecture Design -> Faculty of Architecture		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Andrzej Kulowski	
	Teachers	dr inż. arch. Joanna Kabrońska prof. dr hab. inż. Andrzej Kulowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	30.0	0.0	0.0	0.0	45

E-learning hours included: 20.0

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	45	5.0	25.0	75

Subject objectives

The student recognizes the basic physical processes in buildings and the relationship between the building and the environment. The student recognizes the mechanism of transmission of sound and vibration in building construction and spread of environmental noise. The student learns the principles of protection and anti-vibration proofing of the building and the environment and the shaping the acoustics of rooms.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] is able to use analytical methods to formulate and solve project tasks	The student evaluates design solutions of the building taking into account the energy quality and the internal environment. The student calculates the thermal and moisture properties of building elements.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W01] knows and understands construction problems, building and engineering issues related to building design; principles, solutions, constructions and building materials used in simple engineering tasks in the field of architectural and urban design	The student understands physical phenomena occurring in buildings and between the building and the environment, including issues of heat and moisture, and knows the principles of design that will reduce energy consumption of the building and enable a proper microclimate in the building. The student has knowledge of the mechanism of sound and vibration transmission in buildings and noise propagation in open space, and identifies the parameters and technical information relating to acoustical characteristics of building materials and acoustical requirements of buildings contained in the standards and professional literature.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

Subject contents	**BULIDING PHYSICS** Lectures: 1. Architecture and climate. Energy quality. Energy: introduction 2. Physical phenomena in buildings: basics of heat transfer theory 3. Inhomogeneous layers and thermal bridges 4. Humidity and moisture protection 5. Energy performance. Requirements. Certification Tutorials: 1. Relationship between the building and the environment - various aspects 2. Thermal and moisture properties of building elements **ACOUSTICS** Lectures: 1. Physics of sound. Acoustic pressure, decybel, sound level, sound spectrum, range of heating. airborn and material sound. 2. Room acoustics. Acoustical phenomena in rooms. Acoustical parameters of rooms. 3. Acoustical properties of finishing materials and elements of room equipment, sound absorption coefficient. 4. Shaping of acoustics of rooms. Influence of function, form, and interior of a hall on its acoustics. 5. Building acoustics. Mechanism of propagation sound sound and vibrations in buildings. Air-born and material-born sound. Installation noise. 6. Acoustical properties of building materials. Acoustical insulation of partitions. Law mass. 7. Protection of the building against noise and vibrations. Positioning of buildings with respect to external sources of noise and vibration, protection against soil-borne vibrations, layout of rooms, preventing the transmission of noise and vibration in the building. 8. Urban acoustics protection of buildings, groups of buildings and urban interiors against noise 9. Acoustical climate of the town. Parameters of acoustical climate. Acoustic plan od the city - synthetic and analytical, current and predictive. Noise maps. 10. Environmental acoustics. Propagation of sound in open space. Influence of wind and temperature. Noise suppression by the surface of the soil with various types of coverage. 11. Protection of terrain against industrial noise. Wind turbine noise.

12. Aircraft noise. Noise induced degradation of terrain function. Area of restricted use.

13. Acoustis in construction law. Protection of the building, built-up area and the land against the noise and vibrations in the light of Polish Standards and accompanying regulations

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Presentation	100.0%	20.0%
Test	51.0%	30.0%
Calculation task	100.0%	50.0%

Recommended reading

Basic literature	Kaliszuk-Wietecka A.: Budownictwo zrównoważone. Wybrane zagadnienia z fizyki budowli, 2017 Geryło R.: Nowoczesny standard energetyczny budynków, 2015 Sadowski J.: Akustyka architektoniczna. PWN, Warszawa 1976 Kulowski A.: Akustyka sal - zalecenia projektowe dla architektów. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2011
Supplementary literature	Trogal K., Bauman I., Lawrence R., Petrescu D. (red.): Architecture and Resilience. Interdisciplinary Dialogues, 2019 La Roche P.: Carbon-Neutral Architectural Design, 2017 Naboni E., Havinga L. (red.): Regenerative Design in Digital Practice. A Handbook for the Built Environment, 2019 Eames M. (red.): Retrofitting Cities for Tomorrows World, 2018 Lehmann S.: Urban Regeneration. A Manifesto for transforming UK Cities in the Age of Climate Change, 2019 Delgado Ramos G. C.: Climate Change-Sensitive Cities: Building Capacitites for Urban Resilience, Sustainability & Equity, 2017 Ciesielski R., Kawecki J., Maciąg E.: Ocena wpływu wibracji na budowle i ludzi w budynkach. Instytut Techniki Budowlanej, Warszawa 1993 Kulowski A.: Ćwiczenia projektowe z akustyki pomieszczeń z wykorzystaniem programu komputerowego "Sabine" (instrukcja laboratoryjna)
eResources addresses	Adresy na platformie eNauczanie: AKUSTYKA ARCHITEKTONICZNA - Moodle ID: 25193 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25193

Example issues/ example questions/ tasks being completed

Calculate hygrothermal properties of building elements (different types)

Work placement

Not applicable