



Subject card

Subject name and code		Building physics and acoustics, PG_00052641						
Field of study		Architecture						
Date of commencement of studies		October 2021	Academic year of realisation of subject			2023/2024		
Education level		first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study		Full-time studies	Mode of delivery			at the university		
Year of study		3	Language of instruction			English		
Semester of study		5	ECTS credits			3.0		
Learning profile		general academic profile	Assessment form			assessment		
Conducting unit		Department of Technical Fundamentals of Architectural Design -> Faculty of Architecture						
Name and surname of lecturer (lecturers)		Subject supervisor		dr inż. arch. Joanna Kabrońska				
		Teachers		dr inż. arch. Joanna Kabrońska				
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: 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	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 thermal and moisture properties of building elements.			[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject		
		[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.			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		

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 hearing. airborne 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.

	<p>12. Aircraft noise. Noise induced degradation of terrain function. Area of restricted use.</p> <p>13. Acoustics 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</p>			
Prerequisites and co-requisites				
Assessment methods and criteria		Subject passing criteria	Passing threshold	Percentage of the final grade
		Calculation task	100.0%	50.0%
		Test	51.0%	30.0%
		Presentation	100.0%	20.0%
Recommended reading	Basic literature	<p>Kaliszuk-Wietecha A.: Budownictwo zrównoważone. Wybrane zagadnienia z fizyki budowli, 2017</p> <p>Geryło R.: Nowoczesny standard energetyczny budynków, 2015</p> <p>Beranek L.: Concert and opera halls. How they sound. Acustica Society of America, American Institute of Physics. 1996.</p> <p>Everest Alton F.: Master handbook of acoustics. 2001</p>		
	Supplementary literature	<p>Trogal K., Bauman I., Lawrence R., Petrescu D. (ed.): Architecture and Resilience. Interdisciplinary Dialogues, 2019</p> <p>La Roche P.: Carbon-Neutral Architectural Design, 2017</p> <p>Naboni E., Havinga L. (ed.): Regenerative Design in Digital Practice. A Handbook for the Built Environment, 2019</p> <p>Eames M. (ed.): Retrofitting Cities for Tomorrows World, 2018</p> <p>Lehmann S.: Urban Regeneration. A Manifesto for transforming UK Cities in the Age of Climate Change, 2019</p> <p>Delgado Ramos G. C.: Climate Change-Sensitive Cities: Building Capacities for Urban Resilience, Sustainability & Equity, 2017</p> <p>Ando Y. : Concert Hall Acoustics. Springer Verlag, Berlin 1985.</p> <p>Egan M.D.: Architectural Acoustics. McGraw, New York 1988.</p> <p>Jordan V.L.: Acoustical Design of Concert Halls and Theatres. Applied Science Publishers Ltd., London 1980.</p> <p>Knudsen V.O., Harris C.M.: Acoustical Designing in Architecture. American Institute of Physics, 1988</p>		
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Building Physics 2023/24 - Moodle ID: 31234 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=31234</p> <p>AKUSTYKA ARCHITEKTONICZNA 2023/24 - Moodle ID: 33208 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=33208</p>		
Example issues/ example questions/ tasks being completed	Calculate hygrothermal properties of building elements (different types)			
Work placement	Not applicable			

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