

MODULE SPECIFICATION

Module code	
Module title in Polish	Fizyka budowli
Module title in English	Physics of Structures
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Civil Engineering
Level of qualification	First cycle <i>(first cycle, second cycle)</i>
Studies profile	Academic <i>(academic/practical)</i>
Mode of study	Full-time <i>(full-time / part-time)</i>
Specialism	
Organisational unit responsible for module delivery	The Department of General Civil Engineering
Module co-ordinator	Jerzy Z. Piotrowski, PhD hab., Eng., Professor of the University
Approved by	Marek Iwański, Professor

B. MODULE OVERVIEW

Module type	Core module <i>(core/programme-specific/elective HES*)</i>
Module status	Compulsory module <i>(compulsory / non-compulsory)</i>
Language of module delivery	English
Semester in the programme of study in which the module is taught	Semester 4
Semester in the academic year in which the module is taught	Summer semester <i>(winter / summer)</i>
Pre-requisites	None <i>(module code/module title, where appropriate)</i>
Examination required	No <i>(yes / no)</i>
ECTS credits	2

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15			15	

* elective HES – elective modules in the Humanities and Economic and Social Sciences

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with: the theory of heat transfer and moisture motion in constructional elements; heat permeation through building dividing structures (drawing attention to heat bridges and thermal comfort of a man). Another aim is to acquaint students with the abilities of determining the coefficients of heat permeations for constructional elements and preparing an energy balance of a building.
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Module outcome code	Module learning outcomes	Mode of instruction (l/c/lab/p/ others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student is knowledgeable about physical phenomena taking place in a building and its elements.	l/p	B_W01	T1A_W01; T1A_W02
W_02	A student knows the notions and methods as regards heat and moisture transfer in rooms, heat transfer through dividing structures.	l/p	B_W08 B_W19 B_W21	T1A_W01; T1A_W02; T1A_W03; T1A_W04; T1A_W06; T1A_W07; T1A_W08;
U_01	A student can determine the coefficients of heat permeation for constructional dividing structures.	l/p	B_U13 B_U24 B_U26	T1A_U03; T1A_U05; T1A_U07; T1A_U08; T1A_U09; T1A_U10; T1A_U11; T1A_U13; T1A_U14; T1A_U15; T1A_U16
U_02	A student is capable of preparing heat and moisture analysis for dividing structures.	l/p	B_U13 B_U24 B_U26	T1A_U03; T1A_U05; T1A_U07; T1A_U08; T1A_U09; T1A_U10; T1A_U11; T1A_U13; T1A_U14; T1A_U15; T1A_U16
U_03	A student is able to prepare an energy balance for a building.	l/p	B_U13 B_U24 B_U26	T1A_U03; T1A_U05; T1A_U07; T1A_U08; T1A_U09; T1A_U10; T1A_U11; T1A_U13; T1A_U14; T1A_U15; T1A_U16
U_04	A student can use basic norms, directives, and guidelines which concern designing.	l/p	B_U13	T1A_U05; T1A_U07;

				T1A_U11; T1A_U15; T1A_U16
K_01	A student can work individually.	p	B_K01	T1A_K01; T1A_K03; T1A_K04
K_02	A student is responsible for the reliability of the presented results.	p	B_K02	T1A_K02; T1A_K05; T1A_K07
K_03	A student formulated conclusions and describes the results of his/her own work.	p	B_K04	T1A_K01; T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Introduction to the subject. A structure in relation to the environment; the issues of modern building physics. Building physics in constructional design. The theory of heat transfer: the types and laws of heat transfer (conduction, convection, and radiation).	W_01
2	Heat permeation through dividing structures (thermal and physical properties of construction material, heat accumulation, thermal stability as well as dynamic thermal properties of dividing structures).	W_01 W_02 U_01
3	Two-directional heat permeation. Thermal bridges. The impact of thermal bridges on heat losses in buildings.	W_01 W_02 U_04
4	Water vapour diffusion through dividing structures (the description of the phenomenon, moisture condensation, moisturising of dividing structures; the methods of limiting and eliminating dividing structures moisturising).	W_01 W_02 U_02 U_04
5	The principles of dividing structures in terms of heat and moisture (drawing the purpose of buildings). The requirements as well as tendencies in the standardisation of heat protection of buildings in Poland. Energetic certification of buildings.	W_02 U_01 U_02 U_04
6	Energy-saving buildings (assessment criteria; the classification of design and realisation principles). Ventilation with respect to air quality in buildings. Ventilation of energy-saving buildings. A building in relation to man's health (air quality in buildings, protection against condensation moisture).	W_02 U_03 U_04
7	Buildings totally and partly submerged in soil (their classification, typical constructional elements, heat transfer through soil, the problems concerning thermal protection; thermal effects of integrating a building with soil. Passive and active systems of obtaining solar energy in buildings. Shaping a thermal balance of windows and glass elevation facades.	W_02 U_03

2. Topics to be covered in the classes
3. Topics to be covered in the laboratories
4. Topics to be covered in the projects

Project number	Topics	Module outcome code
1-2	Calculations concerning heat transfer in dividing structures; determining heat coefficients for various types of dividing structures.	W_01 W_02 U_01 U_04
3	Thermal and moisture analysis with the use of a computer program	W_02

	(individual subject for each subject).	U_02 U_04
4-5	Calculating the coefficients of permeation for inhomogeneous dividing structures (individual subject for each student).	W_02 U_02 U_04
6-7	Preparing energy balance of a building with the use of a computer program (individual subject for each student); preparing a report from the completed calculations; defending a project.	W_02 U_01 U_02 U_03 U_04

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	A test and a project
W_02	A test and a project
U_01	A test and a project
U_02	A test and a project
U_03	A project
U_04	A project
K_01	A test and a project
K_02	A test and a project
K_03	A project

C. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	15
2	Contact hours: participation in classes	
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	3
5	Contact hours: participation in project-based classes	15
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	Number of contact hours	33 <i>(total)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit =25-30 hours of study time)</i>	1.3
11	Private study hours: background reading for lectures	3
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	5
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	10

18	Private study hours: preparation for an examination	
19		
20	Number of private study hours	18 <i>(total)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit =25-30 hours of study time)</i>	0.7
22	Total study time	51
23	Total ECTS credits for the module <i>(1 ECTS credit =25-30 hours of study time)</i>	2
24	Number of practice-based hours <i>Total practice-based hours</i>	28
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit =25-30 hours of study time)</i>	1.1