

MODULE SPECIFICATION

Module code	
Module title in Polish	Trwałość budowli
Module title in English	Building Durability
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	The Technology and Organisation of Civil Engineering
Organisational unit responsible for module delivery	The Department of Building Engineering Technologies and Organization
Module co-ordinator	Justyna Zapala-Slaweta, PhD, Eng.
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 7
Semester in the academic year in which the module is taught	Winter 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 aims of the module include: learning the mechanisms of destructive influence of the environment on building structures; acquiring the ability of rational selection of components and surface protection of concrete which provide high durability of objects (this knowledge gives reasons for the specification and designing the composition of concrete drawing attention to its durability).
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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 has basic knowledge about cement and concrete chemistry which enables understanding basic corrosion process which are significant in civil engineering.	l/p	B_W02	T1A_W01 T1A_W02
W_02	A student is knowledgeable about the components of concrete and internal structure of concrete (its properties and application in environments chemically aggressive).	l/p	B_W18	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W07 T1A_W08
W_03	A student has fundamental knowledge on the life cycle and durability of building objects.	l/p	B_W21	T1A_W06
W_04	A student knows the fundamentals of designing, analysing and exploiting typical building objects.	l/p	B_W 08 B_W10	T1A_W03 T1A_W04 T1A_W05 T1A_W07 T1A_W08
U_01	A student can use basic norms, directives, and guidelines concerning the exploitation of building objects and their elements with reference to a construction building durability.	l/p	B_U13	T1A_U05 T1A_U07 T1A_U11 T1A_U15 T1A_U16
U_02	A student can rationally select a qualitative composition of concrete with respect to a construction building durability.	l/p	B_U24	T1A_U03 T1A_U05 T1A_U08 T1A_U09 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_03	A student can specify and design concrete paying attention to durability requirements formulated in appropriate norms and regulations.	l/p	B_U24	T1A_U03 T1A_U05 T1A_U08 T1A_U09 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_04	A student can apply basic methods of surface protection of reinforced concrete building structures against corrosion.	l/p	B_U25	T1A_U09 T1A_U13 T1A_U15
K_01	A student can work individually and co-operate in a	p	B_K01	T1A_K01

	team on the assigned task.			T1A_K03 T1A_K04
K_02	A student is aware of the value concerning resourcefulness in engineering activities and reasoning.	p	B_K03	T1A_K01 T1A_K05 T1A_K06

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	The durability of building structures: the concept of durability; the factors having a destructive impact on a building structure; the causes of degradation of reinforced concrete structures.	W_03 U_01
2	Concrete durability in terms of new European norm, i.e. PN-EN 206-1: - the classes of exposition and boundary values in concrete composition - the classes of exposition in building structures - basic principles of designing the composition of concrete (taking the durability of reinforced concrete structure)	W_01 U_01 U_02 U_03
3	Physical and chemical structure of concrete with respect to durability: - the components of concrete structure - cement paste–aggregate interfacial transition zone - the modification of concrete structure	W_01 W_02
4	The factors and destructive processes of concrete: - chemical corrosion in reinforced concrete structures (carbonatisation, chloride corrosion, sulphate corrosion, magnesium and acid corrosion) - physical destruction of concrete caused by the changes in temperature and humidity - biological corrosion - mechanical factors: excess load, cyclical and permanent load	W_01 W_03
5	Corrosion hazards from water and soil as well as industrial environment.	W_01 W_02 W_03 U_02
6	Protection of building structures against degradation: - material and structural protection - surface protection	W_02 W_03 U_03 U-04
7	Assessing the causes and degree of concrete and steel degradation in reinforced concrete structures.	W_03
8	Obtaining a credit for the subject (a written test).	W_01 W_02 W_03 W_04 U_01 U_02 U_03 U-04

2. Topics to be covered in the classes

3. Topics to be covered in the laboratories

4. Topics to be covered in the projects

No.	Topics	Module outcome code
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1.	The characteristics of the selected constructional element and its role in the building structure (description and drawings).	W-04 U_01 K_01 K_02
2.	Determining exposition class reflecting the conditions of utilising a selected reinforced concrete structure on the basis of the requirements concerning PN-EN 206-1 norm.	W_01 W_02 W_03 U_01 U_02 U_03 K_01 K_02
3.	Determining boundary technological parameters of concrete on the basis of exposition classes.	W_03 U_01 U_02 U_03 K_01 K_02
4.	Qualitative selection of the type and class of cement.	W_02 U_01 U_02 U_03 K_01 K_02
5.	Qualitative selection of the types of aggregate.	W_02 U_01 U_02 U_03 K_01 K_02
6.	Rational selection of chemical additions.	W_02 U_01 U_02 U_03 K_01 K_02
7.	Determining minimum thickness of concrete cover and the contents of chlorides in the constructional element.	W_02 U_01 U_02 U_03 K_01 K_02
8.	Rational selection of surface protection of concrete against chemical corrosion.	W_03 U_04 K_01 K_02
9.	A credit: - submitting written report and their individual defence - a final test (a teamwork)	W_01 W_02 W_03 U_01 U_02 U_03 U_04 K_01 K_02

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 report (individual defence)
W_02	A report (individual defence)
W_03	A report (individual defence)
W_04	A report (individual defence)
U_01	A report (individual defence)
U_02	A report (individual defence)
U_03	A report (individual defence)
U_04	A report (individual defence)
K_01	A final test
K_02	A final test

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)	2
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	32 <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	5
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	8
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	50
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>	25
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit =25-30 hours of study time)</i>	1