



COURSE SPECIFICATION

Course code	full-time:	B1S-TiOB-610
	part-time:	BN1-7-TiOB-711
Course title in Polish	Trwałość Budowli	
Course title in English	Durability of Buildings and Structures	
Valid from academic year	2023/2024	

CURRICULAR ALIGNMENT

Programme	CIVIL ENGINEERING
Level	first-cycle
Programme profile	academic
Mode of attendance	full-time; part-time
Specialism	Construction Technology and Project Management
Academic unit responsible for the course	Department of Construction Technology and Project Management
Course coordinator	dr hab. inż. Justyna Zapała-Sławeta, prof PŚK
Approved by	prof. dr hab. inż. Grzegorz Świt

COURSE DESCRIPTION

Teaching block	Specialism specific	
Course status	elective	
Language of instruction	Polish	
Semester of delivery	full-time	semester VI
	part-time	semester VII
Prerequisites	Chemistry, Building Materials, Concrete Technology	
Exam (YES/NO)	NO	
ECTS	2	

Mode of teaching		lecture	class	lab	project	other
Number of hours per semester	full-time:	15			15	
	part-time:	10			10	

LEARNING OUTCOMES

Category	Code	Learning outcomes	Corresponding programme outcome code
Knowledge	W01	Students demonstrate an in-depth knowledge of cement and concrete chemistry that enables understanding basic corrosion processes relevant to construction.	B1_W02
	W02	Students know concrete components and the internal structure of concrete, its properties and use in chemically aggressive environments.	B1_W18 B1_W07
	W03	Students have an in-depth knowledge of the life cycle and durability of buildings and structures.	B1_W21
	W04	Students have an in-depth knowledge of the basics of design, analysis and operation of typical building objects.	B1_W08 B1_W10
Skills	U01	Students are able to use standards, regulations, and guidelines pertaining to the operation of building structures and their components taking into account the durability of structures.	B1_U13
	U02	Students can rationally select the qualitative composition of concrete taking into account the durability of buildings and structures.	B1_U13 B1_U24
	U03	Students can specify and design concrete according to durability requirements set out in relevant standards and regulations.	B1_U09
	U04	Students can identify ways of reinforced concrete surface protection against corrosion.	B1_U25
Competence	K01	Students can work independently and cooperate in a team on an assigned task.	B1_K01
	K02	Students are aware of the value of entrepreneurship in engineering activities and engineering thinking.	B1_K03
	K03	Students are aware of the need to improve professional competence, independently supplement and extend knowledge.	B1_K03
	K04	Students are aware of the risks occurring in the material-environment system.	B1_K05

COURSE CONTENT

Teaching mode*	Topics covered
lecture	Durability of building structures. The concept of durability. Destructive factors acting on a building or structure.
	Concrete - destructive factors and processes. Chemical attack in reinforced concrete structures: carbonation, chloride-, sulfate-, magnesium-, and acid-induced corrosion. Physical destruction of concrete due to changes in temperature and humidity. Biological corrosion. Mechanical factors: overloading, cyclic and long-term loading. Assessment of the causes and degree of degradation of concrete and steel in structures.
	Durability of concrete in the light of PN-EN 206-1, the new European standard: Exposure classes and limit values for concrete composition. Exposure classes in building structures. Basic principles of concrete composition design, including the durability of reinforced concrete structures.
	Physical and chemical structure of concrete in terms of durability. Components of concrete structure. Aggregate – concrete paste interface. Modification of concrete structure.
	Corrosion hazards from water-soil and industrial environments.

	Protection of building structures from degradation. Material and structural protection. Concrete surface protection.
project	Characterization of the selected structural element and its role within the construction object.
	Indication of exposure classes corresponding to the conditions of use of the selected reinforced concrete structure based on the requirements of PN-EN 206-1.
	Determination of the limiting technological parameters of concrete based on the exposure classes.
	Qualitative selection of the type and class of cement, qualitative selection of the type of aggregate, rational selection of chemical admixtures.
	Determination of the minimum thickness of lagging depending on the class of environment.
	Rational selection of concrete surface protection against corrosion.

METHODS OF LEARNING OUTCOMES VERIFICATION

Learning outcome	Learning outcome verification methods					
	Oral exam	Written exam	Test	Project	Report	Other
W01			X	X		
W02			X	X		
W03			X	X		
W04			X	X		
U01			X	X		
U02			X	X		
U03			X	X		
U04			X	X		
K01				X		X
K02				X		
K03			X	X		
K04			X	X		

ASSESSMENT

Teaching mode*	Assessment type	Criteria
lecture	mark-based	<i>Obtaining at least a passing grade on the written test.</i>
laboratory	mark-based	<i>Obtaining at least a passing grade on the project and individual defence.</i>

STUDENT WORKLOAD

ECTS weighting														
	Activities	Student workload										h		
		full-time					part-time							
		W	C	L	P	S	W	C	L	P	S			
1.	Scheduled contact hours	15			15		10		10					h
2.	Other (office hours, exams)	2			2		2		2					h
3.	Total number of contact hours	34					24					h		
4.	Number of ECTS credits for contact hours	1,4					1,0					ECTS		
5.	Independent study hours	16					26					h		
6.	Number of ECTS credits for independent study	0,6					1,0					ECTS		
7.	Practical hours	25					25					h		
8.	Number of ECTS credits for practical hours	1,0					1,0					ECTS		
9.	Total workload	50					50					h		
10.	ECTS credits for the course <i>1 ECTS credit =25 student learning hours</i>	2												

READING LIST

1. Ściślewski Z.: Trwałość budowli, Politechnika Świętokrzyska, Kielce 1995.
2. Ściślewski Z.: Ochrona konstrukcji żelbetowych, Arkady, Warszawa 1999.
3. Gruener M.: Korozja i ochrona betonu, Arkady, Warszawa 1983.
4. Stefańczyk B. et al.: Budownictwo ogólne, Tom 1, Materiały i wyroby budowlane, Arkady, Warszawa 2007.
5. Klemm P. et. al.: Budownictwo ogólne, Tom 2, Fizyka budowli, Arkady, Warszawa 2009.
6. Namiętło W., Kazimierz F.: Katalog elementów budowlanych: poradnik projektowania na trwałość według norm nowej generacji, WNT, Warszawa 2007.
7. Kurdowski W.: Chemia cementu i betonu, PWN, Warszawa 2010.
8. Adjudkiewicz A.: Aspekty trwałości i wpływu na środowisko w projektowaniu konstrukcji betonowych, Przegląd budowlany, nr 2/2011.
9. Adjudkiewicz A.: Eurokod 2 Podręczny skrót dla projektantów konstrukcji żelbetowych, Kraków 2009.
10. Beata C, Dzierżewicz Z.: Czynniki sprzyjające biologicznej korozji konstrukcji żelbetowych, Przegląd budowlany nr 7-8/2007.
11. Czarnecki L., Emmons P.: Naprawa i ochrona konstrukcji betonowych, Polski Cement, Kraków 2002.