STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Construction Chemistry**		Code **1010101111010110053**
Field of study **Civil Engineering First-cycle Studies**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 1**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **from field**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **4 100%** **4 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of periodic table and the properties of basic chemical compounds (organic and inorganic). Knowledge of basic physical phenomena and chemical processes.
2	**Skills**	Ability to write chemical reactions and do the basic stoichiometric calculations.
3	**Social competencies**	Awareness of the necessity for constant updating and complementing one's knowledge and skills.

Assumptions and objectives of the course:

To gain the basic knowledge of physicochemical processes occurring during production and application of building materials.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student knows and understands theoretical basics of the chemical and physicochemical processes occurring in building materials during their production and application. - [K_W01, K_W02, K_W11, K_W13]

2. The student has solid knowledge of building material choice, depending on their physicochemical and applicable properties, as well as he/she has a basic knowledge of building materials research methods. - [K_W02, K_W03, K_W04, K_W10, K_W11-14]

Skills:

1. On the basis of the gained knowledge the student is able to characterise the physicochemical properties of building materials and to adequately choose types of building materials with reference to their practical application. - [K_U17, K_K03, K_U03, K_U05]

2. The student is able to write chemical reactions describing processes occurring in mineral bonds, during polymer compound creation and in corrosion processes of building materials. - [K_U17, K_K03, K_U03, K_U05]

Social competencies:

1. The student has the ability to plan team work, to divide tasks among the members of the research team, to critically discuss the results and formulate collaborative conclusions (conclusions based on the team work). - [K_U01-K_U21, K_K01, K_K03, K_K09]

Assessment methods of study outcomes

Lectures

Two colloquiums - the dates given at the beginning of the semester. First meant to check the ability to write chemical equations and doing basic chemical calculations. The second checks the knowledge of basic physicochemical properties of building materials.

Laboratory classes

A short verbal test at the beginning of the class. A colloquium at the end of the semester covering the material of the laboratory classes.

Course description

Lecture

Structure and chemical properties of water. Water for constructional purposes. Chemical reactions in aqueous environment.

Complex systems occurring in construction; colloidal systems.

Types of chemical compounds and chemical processes occurring during production, application and exploitation of building materials.

Chemical composition and structure of building materials as determinants of their physicomechanical and applicable properties. Thermodynamic conditions of durability of building materials. Phase transitions.

Basics of crystal chemistry of building materials. The structure of silicates and aluminosilicate minerals.

Kinetics of chemical reactions occurring in construction. Catalysis.

Chemistry of mineral binders. Hydraulic and air binders. Processes occurring during obtaining, bonding and hardening of cement, lime, gypsum, silicate and magnesium binders.

Structure and properties of metals applied in construction.

Polymers as components of plastics used in construction, their properties and obtaining.

Processes occurring during degradation of building materials. Corrosion of concrete. Corrosion of reinforcing bars in reinforced concrete. Corrosion of polymers.

Recycling of building materials.

Topics of the laboratory classes:

1. Basics of the chemical quality analysis. Identification analysis of chosen cations.
2. Basics of the chemical quantity analysis. Defining the sodium hydroxide concentration with the use of the acid-base titration.
3. Hydrolysis of the salts and defining the pH of the aqueous solutions.
4. Kinetics of chemical reactions.
5. Corrosion of building materials. Estimation of the corrosion stage of cement stone and definition of the stage of concrete carbonisation.
6. Chemical corrosion of steel. Estimation of the corrosion strength of ordinary steel and that with anti-corrosive coating.

Basic bibliography:

1. W. Skalmowski, Chemia materiałów budowlanych, Arkady 1997
2. L. Czarnecki, T. Broniewski, O. Henning, Chemia w budownictwie, Arkady, Warszawa 1996
3. W. Kurdowski, Chemia cementu i betonu, PWN, Warszawa 2010

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in laboratorys	15
3. Preparation to laboratories	5
4. Preparation to final laboratory's test	5
5. Praparation to final lecture's test	15

Student’s workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	45	2
Practical activities	15	1