(faculty stamp)

COURSE DESCRIPTION

1. Course title: CHEMISTRY	**2. Course code**
3. Validity of course description: 2015/2016	
4. Mode of studies: intramural studies	
5. Level of studies: BSc programme	
6. Field of study: POWER ENGINEERING	
7. Profile of studies: general academic	
8. Programme: Sustainable Energy Engineering	
9. Semester: I **(Lecture, Class) II (Laboratory)**	
10. Faculty teaching the course: Institute of Water and Wastewater Engineering	
11. Course instructor: Irena Korus, PhD, DSc	
12. Course classification: common course	
13. Course status: compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: none	

16. Course objectives:

Main objective of the course is to complement the student's knowledge of the basic concepts of the general, inorganic and organic chemistry, allowing the understanding of the basic phenomena and chemical processes and their use in engineering practice.

17. Description of learning outcomes:

No	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	To have a basic knowledge of the atomic structure and the periodicity of elements. To understand chemical bonds and intermolecular and intramolecular forces.	Final test	Lecture	K1A_W05 K1A_U01
2.	To know the basic concepts, laws and phenomena on the states of matter, solutions, chemical equilibrium and chemical kinetics.	Final test	Lecture	K1A_W05 K1A_U01
3.	To know the basic concepts, laws and phenomena relating to electrolyte solutions and electrochemistry.	Final test	Lecture	K1A_W05 K1A_W08 K1A_U01
4.	To have a basic knowledge of the organic chemistry, selected organic compounds and reactions.	Final test	Lecture	K1A_W05 K1A_U01
5.	To be able to perform simple calculations in the field of chemical stoichiometry, solution concentrations, gaseous solutions, pH and ionic water equilibrium, galvanic cells and electrolysis.	Written test	Problem solving (class)	K1A_W05 K1A_U01
6.	To be able to determine basic physicochemical parameters of water and to select adequate method for water deionization and softening. To be able to conduct simple experiments in the field of electrochemistry and interpret the results.	Written test/evaluation of the laboratory work	Laboratory	K1A_W05 K1A_U09
7.	To be able to co-operate in a group.	Evaluation of the laboratory work	Laboratory	K1A_K03

18. Teaching modes and hours

Lecture	Class	Laboratory	Project	BA /MA Seminar
30	15	15	-	-

Syllabus description:

Lecture:

Atomic structure. Subatomic particles, the structure of electron shells, electron configuration of elements.

Periodic table. The law of periodicity of chemical elements, periodic table of elements.

Chemical bonds. Ionic bond, covalent (atomic) bond (non-polar, polar, coordinated), hybridization, metallic bond, intermolecular interactions (hydrogen and van der Waals bond).

States of matter. Gaseous state, gas laws, liquid state, solid state, crystals, amorphous solids, phase transitions.

Solutions. Solutions of gases in liquids, Henry's law, solutions of liquids in liquids, solutions of solids in liquids, Raoult's law, colligative properties.

Chemical statics. Reversible reactions - the equilibrium state, equilibrium constant, Le Chatelier's principle.

Chemical kinetics. Reaction rate, reaction kinetic equation, molecularity and the reaction order, activation energy and Arrhenius law.

Electrolytes. Arrhenius theory of dissociation, ionic water equilibrium, pH, ionic reactions, buffer solutions, solubility equilibrium, Brønsted-Lowry theory of acids and bases.

Electrochemistry. Half-cells – metals electrode potentials, metals galvanic series, galvanic cells, electrolysis, secondary cells (batteries), corrosion.

Basics of organic chemistry. Hydrocarbons (alkanes, alkenes, alkynes, cycloalkanes, aromatic hydrocarbons), alcohols, phenols aldehydes and ketones, carboxylic acids, amines, carbohydrates.

Class

Solution of basic chemical problems related to: chemical stoichiometry, solution concentrations, gaseous solutions, pH and ionic water equilibrium, galvanic cells and electrolysis.

Laboratory:

Determination of physicochemical parameters of water. Water softening by chemical and thermal methods. Water demineralization using ion-exchangers. Galvanic cells and electrochemical series. Corrosion and its inhibition. Electrolysis of salts in aqueous solutions.

19. Examination: no

20. Primary sources:

1. J.B. Russell, General Chemistry, McGraw-Hill,
2. K.C. Timberlake, Chemistry, Prentice Hall,
3. J.E. McMurry, R.C. Fay, Chemistry, Prentice Hall,
4. N.L. Glinka, Problems and exercises in general chemistry, Mir.
5. R. Chang, Chemistry, McGraw-Hill,
6. L. Jones, P. Atkins - Chemia ogólna, PWN, Warszawa, 2004.
7. M.I. Sienko, R.A. Plane - Chemia. Podstawy i zastosowanie, WNT, Warszawa, 1999.
8. G. Patrick, Chemia organiczna. Krótkie wykłady, Wydawnictwo Naukowe PWN, 2008.
9. Materials provided by teachers.

21. Secondary sources:

1. M. Bodzek, J. Cebula (red.), Materiały pomocnicze do ćwiczeń tablicowych z chemii dla kierunku studiów inżynieria środowiska, Wydawnictwo Politechniki Śląskiej, Gliwice 2003.
2. K.M. Pazdro, K. Pazdro, Chemia. Podręcznik, cz.1, Wydawca K. Pazdro, 2004.
3. L. Pajdowski - Chemia ogólna, cz. I i II, PWN, Warszawa, 1999
4. A. Bielański - Chemia ogólna i nieorganiczna, PWN, Warszawa, 1981.
5. P. Mastalerz, Chemia organiczna, Wydawnictwo Chemiczne, Wrocław, 2000.

22. Total workload required to achieve learning outcomes

No	Teaching mode:	Contact hours / Student workload hours
1.	Lecture	30/60
2.	Classes	15/30
3.	Laboratory	15/30
4.	Project	
5.	BA/ MA Seminar	
6.	Other	
	Total number of hours:	60/120

24. Total hours:	180
25. Number of ECTS credits:	7
26. Number of ECTS credits allocated for contact hours:	3
27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):	4
28. Comments:	

Approved:

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(date, Instructor's signature) *(date, the Director of the Faculty Unit signature)*