DESCRIPTION OF THE COURSE OF STUDY

Course code	**0531.6.CHEM1.B/C.PCH**	
Name of the course in	Polish	***Podstawy chemii***
	English	***Fundamentals of chemistry***

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	**Chemistry**
1.2. Mode of study	**Full-time studies**
1.3. Level of study	**First-cycle studies**
1.4. Profile of study*	**General academic profile**
1.5. Person/s preparing the course description	**dr Anna Kołbus, dr hab. Beata Szczepanik prof. UJK**
1.6. Contact	**anna.kolbus@ujk.edu.pl**

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	**Polish** **(for foreign students: consultations, laboratory instructions, tasks for the tests and exam – English)**
2.2. Prerequisites*	**Basic knowledge of general chemistry**

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		**Lecture (30 h), exercises (45 h), laboratory (45 h)**
3.2. Place of classes		**Classrooms of the Institute of Chemistry of UJK**
3.3. Form of assessment		**Lecture – exam** **Seminar, laboratory – pass with grade**
3.4. Teaching methods		**Lecture, exercises - problem solving, discussion related to the lecture topics, laboratory - independent experiments.**
3.5. Bibliography	**Required reading**	1. L. Jones, P. Atkins, Chemistry: Molecules, Matter and Change, W. H. Freeman & Co. 2. S. S. Zumdahl, D. J. DeCoste, Chemical Principles, Brooks/Cole, Cengage Learning 3. D. Gergens, Chem 100; Fundamentals of Chemistry, Montezuma Publishing
	Further reading	1. K. Timberlake, W. Timberlake, Basic Chemistry, Pearson

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives ***(including form of classes)***

Lecture (L)

C1 - familiarizing students with contemporary views on the structure of matter, in particular the structure of atoms and molecules and the laws governing chemical transformations

C2 – introduction of concepts from statics, kinetics, catalysis and electrochemistry

Seminar (S)

C1 – introduction of methods for solving chemical tasks within chemical issues

C2 – discussion of lecture topics

Laboratory (C)

C1 – teaching the principles of work in a chemical laboratory, observations and calculations, and drawing appropriate conclusions from experiments performed

4.2. Detailed syllabus ***(including form of classes)***

Lecture (L)

Structure of the atom – Atomic nucleus. Components of the atomic nucleus. Isotopes. Binding energy in the nucleus. Conditions of stability of atomic nucleus. Spontaneous nuclear transformations. Radioactive decay rate. Radioactive balance. Radioactive series. Simple nuclear reactions. Artificial radioactivity. Nuclear fission. Thermonuclear reactions. The use of isotopes in chemistry and medicine. Electronic structure of the atom. Heisenberg's uncertainty principle. Wave functions and Schrödinger's equation. Hydrogen atom. Orbitals in multi-electron atoms. Expansion of electron shells.

Periodic table of elements - Mendeleev's and modern table. The law of periodicity. Structure of the periodic table. The relationship between the position of an element in the periodic table and its structure and properties.

Molecule structure – Main types of chemical bonds. Ionic bond - the essence of the bond, ionic crystals and properties of ionic compounds. Covalent bond - Lewis concept. Molecular orbitals. Homonuclear diatomic molecules. Heteronuclear diatomic molecules. Polyatomic molecules. Hybridization of orbitals. VSEPR theory. Coordination bond. Introduction to coordination compounds (ligand, central atom, coordination number, types of ligands, types of complexes, nomenclature). Metallic bond. Hydrogen bond. Van der Walls interactions.
States of matter - Liquid and solid phases, gas laws, ideal and real gas, characteristics of liquids, crystalline and amorphous substance.
Chemical statics – Irreversible and reversible processes. The law of mass action. Le-Chateliers principle. Solutions and reactions in aqueous solutions: Acids and bases (Arrhenius, Brønsted and Lowry, Lewis, solvent theory). Chemical equilibrium. Equilibrium in aqueous electrolyte solutions. Ion solvation. Water dissociation and pH. Dissociation of acids and bases in aqueous solutions. Application of the law of mass action to the dissociation of acids and bases. Electrolyte activity. Hydrolysis reaction. Buffer solutions. Solubility product. Amphoteric compound.
Chemical kinetics – The rate of chemical reactions. Kinetic equation. Activation energy. The role of the catalyst.
Electrochemistry - Electrode potentials. Types of galvanic cells. Electrolysis and electrolysis processes, Application of electrolysis processes in technology. Examples of cells and batteries. Corrosion and electrochemical protection. Corrosion protection.

Seminar (S)

Stoichiometric calculations (chemical formulas, chemical equations, chemical reaction efficiency). Calculus exercises in the field of calculating solution concentrations (preparation, dilution, concentrating and mixing of solutions). Calculations regarding the ionic balances of strong and weak electrolytes (activity, ionic strength of the solution, pH).
Discussion of the lecture topics.

Laboratory (C)

Application of stoichiometry in practice. Methods of purifying substances. Reactions in aqueous solutions (dissociation, hydrolysis, buffers, solubility). Chemical kinetics.

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of **KNOWLEDGE:**		
W01	knows chemical nomenclature, chemical concepts and phenomena learned within the subject	CHEM1A_W01
W02	knows the structure of the atom and the electronic configurations of the elements	CHEM1A_W01
W03	knows the types of chemical bonds and the dependence of the chemical and physical properties of compounds on the type of interactions between atoms	CHEM1A_W01
W04	knows the physicochemical consequences of reactions in aqueous solutions of electrolytes and the factors influencing the speed of chemical processes	CHEM1A_W01 CHEM1A_W02
W05	defines the chemical concepts, quantities and relationships of statics, chemical kinetics and catalysis learned in the course	CHEM1A_W05 CHEM1A_W02
within the scope of **ABILITIES:**		
U01	performs calculations in the field of stoichiometry, concentrations, ionic balances of strong and weak electrolytes	CHEM1A_U01 CHEM1A_U03
U02	uses nomenclature and chemical concepts	CHEM1A_U01
U03	explains the course of chemical processes by writing down appropriate chemical reactions	CHEM1A_U01
U04	interprets qualitatively and quantitatively chemical experiments at the subject level using the learned formalisms, has the ability to analyze experimental data	CHEM1A_U01 CHEM1A_U11
U05	can plan tasks to be performed (experimental activities) working independently or in a group	CHEM1A_U14
within the scope of **SOCIAL COMPETENCE:**		
K01	understands the limitations of one's own knowledge and the need for lifelong learning	CHEM1A_K01

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	Method of assessment (+/-)														
	Exam oral/ written			Test*			Effort in class*			Group work*			Others: laboratory report		
	Form of classes			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*		
	L	*S*	*C*	*L*	*S*	*C*	*L*	*S*	*C*	*L*	*S*	*C*	*L*	*S*	*C*
W01	+				+	+									+

W02	+														
W03	+														
W04	+					+									+
W05	+					+									+
U01					+	+									+
U02	+				+	+									+
U03	+				+	+									+
U04						+									+
U05								+	+						
K01								+	+						

delete as appropriate

4.5. Criteria of assessment of the intended learning outcomes		
Form of classes	**Grade**	**Criterion of assessment**
Lecture (L) * (including e-learning)	**3**	51–60 % of the total points in the written or oral exam
	3,5	61–70 % of the total points in the written or oral exam
	4	71–80 % of the total points in the written or oral exam
	4,5	81–90 % of the total points in the written or oral exam
	5	91–100% of the total points in the written or oral exam
Seminar (S) * (including e-learning)	**3**	51–60 % of the total points in the written or oral tests
	3,5	61–70 % of the total points in the written or oral tests
	4	71–80 % of the total points in the written or oral tests
	4,5	81–90 % of the total points in the written or oral tests
	5	91–100% of the total points in the written or oral tests
Laboratory (C) * (including e-learning)	**3**	Passing the written or oral entrance tests with a score of 51-60% of the total points. Performing all exercises. Writing all laboratory reports.
	3,5	Passing the written or oral entrance tests with a score of 61-70% of the total points. Performing all exercises. Writing all laboratory reports.
	4	Passing the written or oral entrance tests with a score of 71-80% of the total points. Performing all exercises. Writing all laboratory reports.
	4,5	Passing the written or oral entrance tests with a score of 81-90% of the total points. Performing all exercises. Writing all laboratory reports.
	5	Passing the written or oral entrance tests with a score of 91-100% of the total points. Performing all exercises. Writing all laboratory reports.

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	**122**	
Participation in lectures	30	
Participation in classes, seminars, laboratories	45+45	
Preparation in the exam	2	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	**128**	
Preparation for the lecture, the classes, seminars, laboratories	53	
Preparation for the exam	50	
Preparation of reports from laboratory exercises	25	
TOTAL NUMBER OF HOURS	**250**	
ECTS credits for the course of study	**10**	

delete as appropriate

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

.....