DESCRIPTION OF THE COURSE OF STUDY

Course code		0531.6.CHEM1.B/C.CN			
Name of the course in	Polish	Chemia Nieorganiczna			
	English	Inorganic 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	Undergraduate
1.4. Profile of study*	general academic
1.5. Person/s preparing the course description	Anna Adach
	Agnieszka Jabłońska-Wawrzycka
	summer semester
1.6. Contact	Institute of Chemistry
	Anna.Adach@ujk.edu.pl phone: +48 41 349 7037
	Agnieszka.Jablonska-Wawrzycka@ujk.edu.pl
	phone: +48 41 349 7071

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	English
2.2. Prerequisites*	Basics of Chemistry, Analytical Chemistry, Basic of
	Quantum Chemistry
	*special requirement – participation in winter se-
	mester (III) is possible only after summer course
	passing

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		Lecture: 30 hrs, Seminar: 15 h, Laboratory: working on scientist		
		project 90 hrs		
3.2. Place of classes		Classes in the didactic rooms at the UJK		
3.3. Form of assess	nent	test, final exam		
3.4. Teaching method	ods	Lecture, laboratory (self-conducted experiments), discussion (prob-		
		lem solving)		
3.5. Bibliography	Required reading	C. E. Housecroft, A. G. Sharpe, Inorganic Chemistry, Pearson Edu-		
		cation Limited		
		F. A. Cotton, G. Wilkinson, P. L. Gaus, Basic inorganic chemistry,		
		Wiley		
		S. F. A. Kettle, Physical Inorganic Chemistry. A Coordination Chemis-		
		try Approach, Oxford University Press		
	Further reading	Online original papers from Ebesco, Elsevier, Springer and so on.		

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives (including form of classes)

Lecture:

C1. Building the knowledge base of inorganic and coordination chemistry based on chemistry of the chosen metals Seminar:

C2. Learning the basics of the research methods connected with contemporary inorganic and coordination chemistry Laboratory:

C3. Practical acquisition of laboratory skills, preparation of coordination compounds and characterization by classical chemical analysis, determination of selected physicochemical properties

4.2. Detailed syllabus (including form of classes) Lecture: semester II Introduction to the inorganic chemistry. Classification of elements - modern periodic table of elements (position of an element in the periodic table and its structure and chemistry; periodicity of physical and chemical properties of elements). Types of chemical bonds and properties of compounds. The essence of ionic bonding, ionic crystals and properties of ionic compounds - chemistry of metals and s-block compounds (alkali metals and beryllium metals). The chemistry of p-block elements metals: aluminum to thallium, germanium to lead, bismuth.

Metallic bond - the most important metallic elements and their compounds (Physical properties of metals, the most important methods of preparation, metals as reducing agents - electrochemical series of metals, metal dissolution reactions). The most important d-block transition metals, their compounds and properties. Overview of types of organometallic compounds.

Semester III

Coordination bond – coordination complexes. . Basic concepts: types of ligands, types of complexes, nomenclature, Lewis theory. Coordination number, geometric structure and isomerism of complex compounds. Overview of the most important metal complexes of the 1st series of transition metals. Thermodynamic characterization of complex formation equilibria in solution. Factors influencing the stability of complexes: chelation effect, HSAB theory. The most important methods of complex synthesis. Theories describing coordination bonds in transition metal compounds. Crystal field theory and application to the interpretation of magnetic properties and electronic spectra: spectrochemical and nepheloauxetic series.

Chemistry of non-metals. Physical and chemical properties, methods of preparation and use of hydrogen and hydrides. Boron and its most important compounds. Chemical and biological significance of selected boron compounds. Carbon and silicon. Nitrogen and phosphorus compounds. Oxygen, allotropes, methods of preparation, reactive oxygen species, oxygen as a ligand in biological systems. Characterization of chemical properties of oxides. Water, hydrogen peroxide. Sulfur, selenium and tellurium compounds. Characterization of halogens. Noble gases. Overview of the most important elements in biological systems

Seminary:

I. Elements of inorganic chemistry: oxides and hydrides and their chemical nature (ionic reactions), amphotericity of hydroxides – hydroxocomplexes

II. Types of chemical bonds (including MO theory (energy diagrams), hybridization, VSEPR theory (molecular shapes and structural formulas of the most important acids)).

III. Metals and nonmetals, configurations of atoms and ions of the d block elements.

IV. Selected issues regarding the chemistry of metals and their s-, p- and d-block compounds.

V. Lewis' theory of acids and bases. Examples of complex compounds. Nomenclature

Laboratory:

semester II

Safety, hygiene and rules of work in the inorganic chemistry laboratory - introduction to laboratory exercises.

1. Aluminum and its compounds. Preparation of double salt and complex and examining of their properties.

2. Chemistry of metals of 14 group. Preparation and identification of lead(II) oxide, lead(IV) acetate and tin(IV) iodide.

3. Chemical properties of iron, copper, silver and their selected salts.

4. Dependence of the properties of transition metal compounds on the oxidation state on the example of manganese and chromium compounds.

5. Preparation of aqua-, amina-, chloro- and hydroxocomplexes of transition metals and examination of their chemical properties.

6. Preparation of chromium-potassium alum and chromium(III) complex with urea and examining of their properties.

7. Examing the reaction rate of inorganic compounds. Hydration kinetics of iron(II) tris(1,10-phenanthroline) cation in acidic solution.

8. Nickel and its compounds. Synthesis of double salt and nickel complex.

9. Chemistry of iron compounds. Synthesis and chemical properties of selected iron(II) and iron(III) salts and their chemical analysis.

10. Preparation of potassium oxalate and determination of its purity .

Semester III

Safety, hygiene and rules of work in the inorganic chemistry laboratory - introduction to exercises.

1. Methods of obtaining oxygen and hydrogen in the laboratory and studies on the chemical properties of oxygen and hydrogen.

2. Sulfur and its compounds.

- 3. Chemistry of halogens. Use of analytical and chromatographic methods to separate halide anions in aqueous solution.
- 4. Interhalogen compounds. Preparation of iodine trichloride and examination its properties.
- 5. Photochemical properties of the iron(III) oxalate complex.
- 6. Synthesis and thermal and quantitative analysis of the copper(II) oxalate complex $K_2[Cu(C_2O_4)_2] \cdot 2H_2O$

7. Spectroscopic methods for examining the composition of complexes.

- 8. Determination of the formula and stability constant of the diamine silver(I) complex.
- 9. Chemistry of vanadium compounds. Synthesis and chemical analysis of the obtained isopolyvanadates

4.3 Intended learning outcomes

Code		A student, who passed the course				
			within the sc	ope of KNOWLE	DGE:	•
W01	Knows the chablocks. Know	aracteristics of the s the types of cher	most important el nical bonds and th	lements and their com e most important theo	pounds from the s, p, d pries and concepts	CHEM1A_W01
W02	Knows and co ment's position	rrelate the propert n in the periodic ta	ies of elements an able	d their basic chemica	l compounds with the ele-	CHEM1A_W01
W03	Demonstrates knowledge of basic concepts and research methods of modern coordination and in- organic chemistry					CHEM1A_W07
			within the	scope of ABILITI	ES:	
U01	Correlates the properties of elements and their chemical compounds with their position in the pe- riodic table				CHEM1A_U01	
U02	Student classifies the types of chemical bonds and correlates with the physicochemical properties of compounds					CHEM1A_U01
U03	Student is able to perform simple syntheses and experimental tests in the field of inorganic and co- ordination chemistry and analyze the experimental results				CHEM1A_U02	
U04	Student knows the chemical nomenclature with particular emphasis on the principles used in co- ordination chemistry				CHEM1A_U01	
U05	Acquires teamwork skills and is aware of responsibility for jointly performed tasks			CHEM1A_U014		
within the scope of SOCIAL COMPETENCE:						
K01	Student is aware that theoretical knowledge is necessary for the practical interpretation of chemi- cal phenomena in everyday life				CHEM1A_K01	
4.4. Methods of assessment of the intended learning outcomes						
	Method of assessment (+/-)					
Т	Exam oral/writ- ten* Test* Self-study*					
οι	itcomes	Form of classes	Form of classes	Form of classes		
	(code) $\begin{array}{c c} I^{1} & C & I^{1} & C & I^{2} \\ I^{1} & C & I^{2} & I & C & I^{2} \end{array}$					

	L^{*}	C	 L^{*}	C	L^{z}	C	<i>L</i> ²
W01	+			+	+		+
W02	+			+	+		
W03	+				+		+
U01	+			+	+		+
U02	+			+	+		
U03					+		+
U04	+			+	+		+
U05							+
K01				+	+		

* delete as appropriate L^1 Lecture, C-seminar, L^2 Laboratory

4.5. Crit	4.5. Criteria of assessment of the intended learning outcomes					
Form of classes	Grade	Criterion of assessment				
~ 1	3	Exam : the student must earn at least 60% of the total points.				
i (L ng e	3,5	Exam : the student must earn 70% of the total points.				
ure udin rmin	4	Exam : the student must earn 80% of the total points.				
4,5 Exam : the student must earn 90% of the total points.		Exam : the student must earn 90% of the total points.				
[ij	5	Exam : Student gain more than 95% of total points.				
-ii -ir	3	Tests : the student must earn at least 60% of the total points.				
)* (lear	3,5	Tests : the student must earn 70% of the total points.				
g e- ing)	4	Tests : the student must earn 80% of the total points.				
sses din	4,5	Tests : the student must earn 90% of the total points.				
clar clu	5	Tests : Student gain more than 95% of total points.				
o t h	3	Student performed all practical tasks; wrote reports with corrections; earned 60% of correct answers.				

3,5	Student performed all practical tasks; wrote reports with corrections; earned 70% of correct answers.
4	Student performed all practical tasks; wrote reports without corrections; earned 80% of correct answers.
4,5	Student performed all practical tasks; wrote reports without corrections; earned 90% of correct answers.
5	Student performed all practical tasks; wrote reports without corrections; earned >95% of correct answers.

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

CategoryFull-time studiesExtramural studiesNUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER13580/CONTACT HOURS/6035Participation in lectures*6035Participation in classes, seminars, laboratories*7545INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025		Student's workload			
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER13580/CONTACT HOURS/6035Participation in lectures*6035Participation in classes, seminars, laboratories*7545INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025	Category	Full-time	Extramural studies		
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER13580/CONTACT HOURS/6035Participation in lectures*6035Participation in classes, seminars, laboratories*7545INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025		studies			
/CONTACT HOURS/60Participation in lectures*60Participation in classes, seminars, laboratories*75INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115Preparation for the lecture*202025	NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER	135	80		
Participation in lectures*6035Participation in classes, seminars, laboratories*7545INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025	/CONTACT HOURS/				
Participation in classes, seminars, laboratories*7545INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025	Participation in lectures*	60	35		
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/115170Preparation for the lecture*2025	Participation in classes, seminars, laboratories*	75	45		
Preparation for the lecture*2025	INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	115	170		
	Preparation for the lecture*	20	25		
Preparation for the classes, seminars, laboratories* 40 70	Preparation for the classes, seminars, laboratories*	40	70		
Preparation for the exam/test*2535	Preparation for the exam/test*	25	35		
Others*Reports preparation 30 40	Others*Reports preparation	30	40		
TOTAL NUMBER OF HOURS250250	TOTAL NUMBER OF HOURS	250	250		
ECTS credits for the course of study1010	ECTS credits for the course of study	10	10		

*delete as appropriate

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

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