R O M Â N I A
MINISTERUL EDUCAȚIEI ȘI CERCETĂRII
Universitatea din Craiova
FACULTATEA DE ȘTIINȚE/ DEPARTAMENTUL DE CHIMIE
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Subject Description

1. Program information

1.1. Institution	University of Craiova
1.2. Faculty	Science
1.3. Department	Chemistry
1.4. Study field	Chemistry
1.5. Study level	Master
1.6. Type of education	full-time
1.7. Study program	Advanced Chemistry

2. Subject information

2.1. Subject			**Bioactive coordination compounds**				
2.2. Course coordinator			Prof.dr. Cezar-Ionut Spinu				
2.3. Application coordinator			Lect.dr. Florina Ciolan				
2.4. Year of study	II	2.5. Semester	2	2.6. Type of evaluation	E	2.7. Subject type	DS/DOB

3. Total estimated tipe (hours/semester)

3.1. Number of hours per week	4	from which: 3.2 course	2	3.3. seminar/lab	2
3.4. Total hours in curriculum	48	from which: 3.5 course	24	3.6. seminar/lab	24
Time allocation – hours/week					
Study using textbooks, course materials, bibliographies, and notes					40
Additional documentation in the library, on specialized electronic platforms, and in the field					30
Preparation of seminars/labs, assignments, reports, portfolios, and essays					22
Tutoring					6
Examinations					4
Other activities.....					
3.7. Total hours of individual study					102
3.8. Total hours per semester					150
3.9. Number of ECTS					6

4. Preconditions (if the case)

4.1. of curriculum	•
4.2. of competences	•

5. Conditions (if the case)

5.1. for course	• Lecture hall equipped with computer, video projection system, and internet connection
5.2. for labs	• Laboratory equipped with the materials, equipment, and reagents necessary to carry out experimental work

6. Course objectives - expected learning outcomes achieved by completing and passing the course

Knowledge	1. Graduates define, understand, explain, and apply advanced knowledge of chemistry from specialized literature in practice. 2. Graduates select and use appropriate experimental and theoretical methodologies to investigate complex scientific problems, assessing their impact on the environment and society. 3. Graduates write analysis and scientific reports, presenting the results of their research and experiments, in line with professional ethics and standards. 4. The graduate describes and integrates interdisciplinary knowledge into the implementation of research projects.
Skills	1. Graduates apply major concepts in analytical, inorganic, organic, and physical chemistry to chemical practice. 2. Graduates evaluate and analyze experimental techniques to conduct and design experiments, analyze and test (qualitatively and quantitatively) chemical elements and substances; design, coordinate, and conduct chemical experiments. 3. Graduates apply critical thinking, following the structure and principles of scientific writing to develop and present scientific reports. 4. Graduates apply interdisciplinary methods to solve complex theoretical and practical chemical problems in their professional and research activities.
Responsibility and authonomy	1. Graduates are able to adapt major scientific concepts in the field of chemistry to conduct research, improve or develop new concepts, knowledge, theories, and operational methods, products, and services in order to apply them in specific activities for product and process quality control. 2. Graduates use classical laboratory instruments/techniques and modern equipment independently, design experiments, and interpret and analyze the obtained results accurately. They design learning situations focused on developing experimental techniques and methods specific to chemical laboratories. 3. Graduates prepare and present scientific reports in line with ethical standards for collecting and interpreting results. 4. Graduates assume responsibility for managing interdisciplinary collaborations and coordinating activities within work and research teams..

7. Table of contents

7.1. COURSE	Mode of operation	Teaching methods	Allocated time (hours)
Coordinative chemistry and its importance for biological structures. Ligands. Coordination numbers and stereochemistry of transition metal ion complexes. Chemical bonding in complex compounds. Stability of complex compounds. Chemical reactivity of complexes.	On site (weeks 1-3)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	6
Chemical elements in biological systems	On site (week 4)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Transition metals in enzyme active sites	On site (week 5)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Biological ligands	On site (week 6)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Coordinative chemistry of cobalt in cobalamins (B12 series)	On site (week 7)	Lecture, explanation and interactive presentation,	2

		heuristic conversation, problem solving	
Complex combinations of platinum with antiviral and antitumor activity	On site (week 8)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Active therapeutic complexes: formulations containing amino acids, calcium, aluminum, arsenic, antimony, bismuth, iron, cobalt, silver, gold, zinc, and mercury	On site (weeks 9-10)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Synthetic chelates – models for biological systems	On site (week 11)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Safety, Ethics, and Sustainability Toxicity, environmental impact and circular economy principles for bioactive compounds	On site (week 12)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2

References:

1. C. Spînu, Chimie bioanorganică-curs, Ed. Universitaria Craiova, 176 pag., 2003.
2. A. Pui, D.G. Cozma, Bazele chimiei compuşilor coordinativi, Ed. MatrixRom, Bucureşti, 276 pag., 2003.
3. N. Foca, D. Sibiescu, S. Oancea, Metode fizico-chimice aplicate în studiul combinaţiilor complexe, Ed. Tehnopress, Iaşi, 304 pag., 2006.
4. C. Spînu, Combinaţii complexe cu liganzi cu sulf, Ed. Universitaria, Craiova, 180 pag., 2008.
5. Y. Deswal, S. Asija et al, Transition metal complexes of triazole-based bioactive ligands: synthesis, spectral characterization, antimicrobial, anticancer and molecular docking studies, Research on Chemical Intermediates (2022) 48:703–729. https://doi.org/10.1007/s11164-021-04621-5
6. E. Bortolaminol, F. Visentin, T. Scattolin, Recent Advances in Bioconjugated Transition Metal Complexes for Cancer Therapy, Appl. Sci. 13 (2023) 5561. https://doi.org/10.3390/app13095561
7. Lecture notes, 2025

7.2. Lab	Mode of operation	Teaching methods	Allocated time (hours)
1. Safety rules in chemistry labs	On site (week 1)	Experiment, explanation, discussion, debate, and questioning	2
2. Synthesis of CoSalen-type combinations used as oxygen carriers	On site (week 1)	Experiment, explanation, discussion, debate, and questioning	2
3. Synthesis of two complex combinations of Co(II) and Ni(II) with ligands from the class of N-tyenylmethylidene amines	On site (week 3)	Experiment, explanation, discussion, debate, and questioning	4
4. Vibrational absorption spectroscopy (I.R.) applied in determining the structure of potentially biologically active coordination compounds	On site (week 5)	Experiment, explanation, discussion, debate, and questioning	4
5. Electronic absorption	On site	Experiment, explanation,	4

spectroscopy (UV-VIS) applied in determining the structure of potentially biologically active coordination compounds	(week 7)	discussion, debate, and questioning	
6. General characterization of 2 coordination compounds	On site (weeks 9-11)	Experiment, explanation, discussion, debate, and questioning	6
7. Lab Verification	On site (week 12)	Experiment, explanation, discussion, debate, and questioning	2
References:			
1. Lab work presentations, 2025.			

8. Corrrelation of the discipline content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the course is in line with those of similar courses at universities in Romania and abroad, while also meeting the expectations of professional associations and representative employers in the field.

9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation method	9.3. Contribution to final score
9.4. Course	theoretical concepts and mechanisms, critical analysis of literature or design of a catalytic system	Written Exam	50%
		Portofolio	20%
9.5. Lab	synthesis, characterization, data interpretation	Project Work	30%
9.6. Minimum performance standard			
• Basic understanding of core concepts. • Knowledge of main types of inorganic compounds. • Elementary understanding of synthesis and physoco-chemical characterization methods. • Completion of practical/project tasks			

Date
22.09.2025

Course coordinator,
Prof.dr. Cezar-Ionut Spinu

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Date of approval
25.09.2025

Head of Department,
Conf.dr. Nicoleta Cioateră