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			**Synthesis and structural analysis of inorganic compounds**				
2.2. Course coordinator			Prof.dr. Cezar-Ionut Spinu				
2.3. Application coordinator			Lect.dr. Florina Ciolan				
2.4. Year of study	I	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	56	from which: 3.5 course	28	3.6. seminar/lab	28
Time allocation – hours/week					
Study using textbooks, course materials, bibliographies, and notes					25
Additional documentation in the library, on specialized electronic platforms, and in the field					20
Preparation of seminars/labs, assignments, reports, portfolios, and essays					15
Tutoring					5
Examinations					4
Other activities.....					
3.7. Total hours of individual study					69
3.8. Total hours per semester					125
3.9. Number of ECTS					5

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)
Theoretical considerations on the guiding of fine inorganic synthesis	On site (weeks 1-2)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Inorganic compounds with catalytic properties: synthesis, properties, industrial applications	On site (weeks 3-4)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Inorganic compounds with electrical properties. Conductors, semiconductors, superconductors, insulators: synthesis, properties, and applications in electrical engineering, space technology, and computer science.	On site (weeks 5-6)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Inorganic compounds with magnetic properties. Metals and alloys, transition metal oxides, spinels, garnets, etc. Synthesis, properties, and applications.	On site (weeks 7-8)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Inorganic compounds with biological properties. Synthesis, properties,	On site (weeks 9-10)	Lecture, explanation and interactive presentation,	4

applications		heuristic conversation, problem solving	
Cluster compounds. Synthesis, properties, applications. Binuclear, trinuclear, tetranuclear, penta- and hexanuclear clusters. Non-stoichiometric compounds: monoxides, rutile and fluorine-type dioxides, sulfides, tellurides. Synthesis, structural characteristics, applications.	On site (weeks 11-12)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	4
Other inorganic compounds used in engineering. Composite materials. Synthesis, properties, applications.	On site (week 13)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
Safety, Ethics, and Sustainability Toxicity, environmental impact and circular economy principles for inorganic materials	On site (week 14)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2

References:

1. Thompson D., Insights into Speciality Inorganic Chemicals, The Royal Society of Chemistry, 1995.
2. West A. R., Basic Solid State Chemistry, John Wiley and Sons, 1991.
3. Smart L., Moore E., Introduction a la Chimie du Solide, Masson Editions, Paris,1997.
4. Brauer G., Handbook of Preparative Inorganic Chemistry, Academic Press, New York-London, 1995.
5. Negoiu D., Negoiu M., Structura combinaţiilor anorganice, Editura Tehnică, Bucureşti, 1987.
6. Popa N., Chivu V., Compuşi Anorganici Tehnici, Editura Universităţii Bucureşti, 2000.
7. O. Sadek et al, Synthesis by sol-gel method and characterization of nano-TiO2 powders, Materials Today Proc. 66 (2022) 456-458.
8. N. Li et al, CeO2-stabilised ZrO2 nanoparticles with excellent sintering performances synthesized by sol-gel-flux method, J. Eur. Ceram. Soc. 4(2022) 1645-1655.
9. 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	4
2. Dyes. Synthesis of CdS. Synthesis of zinc ferrate (ZnFe2O4)	On site (week 3)	Experiment, explanation, discussion, debate, and questioning	4
3. Synthesis of $Co(TB)_2$, $Ni(TB)_2$, $Cu(TB)_2$ compounds	On site (week 5)	Experiment, explanation, discussion, debate, and questioning	4
4. Structural investigation of $Co(TB)_2$, $Ni(TB)_2$, $Cu(TB)_2$ by X-ray diffraction and FTIR and Raman spectroscopy	On site (week 7)	Experiment, explanation, discussion, debate, and questioning	4
5. Synthesis of ceramic compounds based on TiO_2	On site (week 9)	Experiment, explanation, discussion, debate, and questioning	4
6. Physico-chemical	On site	Experiment, explanation,	4

characterization of ceramic compounds using UV-Vis, Ir and Raman spectroscopy	(week 11)	discussion, debate, and questioning	
7. Lab Verification	On site (week 13)	Experiment, explanation, discussion, debate, and questioning	4
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