



## COURSE DESCRIPTION

### 1. Program data

1.1 Higher education institution	"ALEXANDRU IOAN CUZA" UNIVERSITY OF IASI
1.2 Faculty	CHEMISTRY
1.3 Department	DOCTORAL SCHOOL OF CHEMISTRY
1.4 Field of study	CHEMISTRY
1.5 Cycle of studies	DOCTORATE
1.6 Study Programme/Qualification	DOCTOR OF CHEMISTRY

### 2. Discipline data

2.1 Name of the discipline	FUNDAMENTAL CONCEPTS AND RECENT DEVELOPMENTS IN CHEMISTRY - MODULE II						
2.2 Course Activity Holder	Prof. univ. dr. Ionel MANGALAGIU Prof. univ. dr. Aurel PUI Prof. univ. dr. habil Romeo-Iulian OLARIU Conf. univ. dr. habil. Gheorghita ZBANCIOC						
2.3 Owner of seminar activities							
2.4 Year of study	I	2.5 Semester	1	2.6 Type of evaluation	C	2.7 Discipline regime	OB

\* OB – Mandatory / OP – Optional

### 3. Total estimated time (hours per semester and teaching activities)

3.1 Number of hours per week	1	of which: 3.2. course	1	3.3. Seminar	-
3.4 Total hours in the curriculum	14	of which: 3.5. course	14	3.6. Seminar	-
Distribution of the time fund					hours
Study by textbook, course material, bibliography and others					24
Additional documentation in the library, on specialized electronic platforms and in the field					50
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					10
Tutoring					-
Examination					2
Other activities					-

3.7 Total individual study hours	86
3.8 Total hours per semester	100
3.9 Number of credits	4

### 4. Preconditions (if applicable)

4.1 Curriculum	
4.2 Competences	

### 5. Conditions (if applicable)

5.1 Course Conduct	
5.2 Conduct of the laboratory	

## 6. Specific competences accumulated

<b>Professional skills</b>	<p><b>CP1:</b> To conceive and carry out original research, based on advanced methods that lead to the development of scientific, technological knowledge and/or research methodologies.</p> <p><b>CP2:</b> Critical-constructive evaluation of the projects and results of the scientific research, appreciation of the state of theoretical and methodological knowledge; identification of the priorities of knowledge and application to the field.</p> <p><b>CP3:</b> Selection and application of principles, theories and advanced methods of knowledge, transfer of methods from one field to another, interdisciplinary approaches to solve new and complex theoretical and practical problems.</p> <p><b>CP4:</b> Use of advanced principles and methods for explaining and interpreting, from multiple perspectives, new and complex theoretical and practical situations/problems, specific to the field.</p> <p><b>CP5:</b> Systematic, advanced knowledge of concepts, research methods, controversies and new hypotheses specific to the field; communication with specialists in related fields.</p>
<b>Transversal competence</b>	<p><b>CT1:</b> Development of projects centered on creativity, as a basis for self-realization.</p> <p><b>CT2:</b> Assuming responsibility and capacity to organize and manage the activity of professional groups, scientific research or organizations/institutions.</p> <p><b>CT3:</b> Initiation and innovative development of complex theoretical and practical projects.</p>

## 7. Objectives of the discipline (from the grid of specific competences accumulated)

<b>7.1. General objective</b>	The course aims to highlight, starting from the fundamental concepts, what are the current trends in the research carried out by the academic staff of the doctoral school of chemistry. The elements of novelty and scientific progress in the field of chemistry will be highlighted, both in relation to the specialized literature and in relation to the results obtained by the doctoral supervisors within the doctoral school of chemistry.
<b>7.2. Specific objectives</b>	<p><b>Objective cognitive</b></p> <ul style="list-style-type: none"> <li>✓ Competences in identifying, developing and elaborating possible research topics.</li> </ul> <p><b>Objective procedurale</b></p> <ul style="list-style-type: none"> <li>✓ Skills in developing review articles for a given topic.</li> <li>✓ To know the research potential of the doctoral supervisors in the doctoral school of chemistry.</li> </ul> <p><b>Objective atitudinale</b></p> <ul style="list-style-type: none"> <li>✓ Correct use of fundamental concepts in relation to current trends in the field of chemistry in order to achieve excellence in research.</li> </ul>

## 8. Content

8.1	Course	Teaching methods	Observations (hours and bibliographic references)
1.	Sonochemistry: applications in materials chemistry	Lecture, explanation, conversation, description, problematization	(3.5 hours, [1]) C-CF&TAC-01
2.	Inorganic materials	Lecture, explanation, conversation, description, problematization	(3.5 hours [3-4])
3.	Techniques for the analysis of multiple variables. Planning experiences and optimizing	Lecture, explanation, conversation, description, problematization	(3.5 hours [5,6])
4.	Azaheterocyclic compounds with biological activity	Lecture, explanation, conversation, description, problematization	(3.5 hours [7,8])

**Bibliography:**

1. T.J. Mason. ed. Advances in Sonochemistry, vols. 1-5. JAI Press: New York, **1990, 1991, 1993, 1996, 1999** Harald Günther, NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry Wiley-VCH, **2013**;
2. Ulrich Schbert, N. Husing, R. Laine (Editors), Materials Syntheses, A practical Guide, Springer Wien New York, 2008.
3. J. L. Lalena, D. A. Cleary, E. E. Carpenter, N. F Dean, Inorganic Materials. Synthesis and fabrication, Wiley-Interscience, 2008.
4. D. W Bruce, D O'Hare, Inorganic Materials, John Wiley & Sons, 1997.
5. Cecilia Arsene, Romeo Iulian Olariu, Metode analitico-statistice in investigarea sistemelor chimice, 241 p., ISBN: 978-973-730-606-7, PERFORMANTICA, Iasi, **2009**;
6. Matthias Otto, Chemometrics. Statistics and Computer Application in Analytical Chemistry, Wiley-VCH Verlag GmbH, **2017**.
7. Zbancioc, G.; Mangalagiu, I.I.; Moldoveanu, C. A Review on the Synthesis of Fluorescent Five- and Six-Membered Ring Azaheterocycles. Molecules 2022, 27, 6321. <https://doi.org/10.3390/molecules27196321>
8. Amariuca-Mantu, D.; Mangalagiu, V.; Danac, R.; Mangalagiu, I.I. Microwave Assisted Reactions of Azaheterocycles for medicinal Chemistry Applications. Molecules 2020, 25, 716. <https://doi.org/10.3390/molecules25030716>

**9. Corroborating the content of the discipline with the expectations of the representatives of the community, professional associations and representative employers in the field related to the program**

After completing and promoting the discipline, the doctoral student will be able to identify a possible research topic and will be able to carry out a research project in a given topic based on a documented literature study.

**10. Rating\***

Activity Type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in final grade (%)
10.4 Course	Correctness and completeness of knowledge as proof of the degree of correct understanding and application of the issues dealt with in the course. The degree of assimilation of the specialized language.	Colloquium – Lecture on a topic of research in the field of interest.	100
10.5 Seminar			
<b>10.6 Minimum Performance Standard</b>			
<ul style="list-style-type: none"> <li>▪ Knowledge of the basic fundamentals for the topics of interest;</li> <li>▪ Correct use of methods and techniques, materials, substances and equipment in compliance with occupational health and safety norms when performing a chemical experiment;</li> <li>▪ The correct selection of the type of analysis method according to the objective of the analysis.</li> </ul>			

Date of completion  
26.09.2024

Course holder  
Prof. univ. dr. Ionel MANGALAGIU

Prof. univ. dr. Aurel PUI

Prof. univ. dr. habil Romeo-Iulian OLARIU

Conf. univ. dr. habil. Gheorghita ZBANCIOC

Seminar holder

Date of approval

Director of the Doctoral School of Chemistry  
Prof. univ. dr. habil. Cecilia ARSENE