

# SYLLABUS

## 1. Information regarding the programme

1.1 Higher education institution	Babeş-Bolyai University, Cluj-Napoca
1.2 Faculty	Chemistry and Chemical Engineering
1.3 Department	Chemistry
1.4 Field of study	Chemistry
1.5 Study cycle	Master
1.6 Study programme / Qualification	Forensic Chemistry (CCR)/ Master's Degree

## 2. Information regarding the discipline

2.1 Name of the discipline	Organic Compounds in Biological Systems – CME 6211						
2.2 Course coordinator	Prof. Dr. Niculina Hădăde						
2.3 Seminar coordinator	Prof. Dr. Niculina Hădăde						
2.4 Year of study	I	2.5 Semester	1	2.6. Type of evaluation	E	2.7 Type of discipline	Mandatory

## 3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					ore
Learning using manual, course support, bibliography, course notes					33
Additional documentation (in libraries, on electronic platforms, field documentation)					14
Preparation for seminars/labs, homework, papers, portfolios and essays					14
Tutorship					4
Evaluations					4
Other activities: not the case					-
3.7 Total individual study hours	69				
3.8 Total hours per semester	125				
3.9 Number of ECTS credits	5				

## 4. Prerequisites (if necessary)

4.1 curriculum	<ul style="list-style-type: none"> <li>Not the case</li> </ul>
4.2 competencies	<ul style="list-style-type: none"> <li>Not the case</li> </ul>

## 5. Conditions (if necessary)

5.1 for the course	<ul style="list-style-type: none"> <li>Students will attend the courses having the materials made available prior to each course</li> </ul>
5.2 for the seminar /lab activities	<ul style="list-style-type: none"> <li>Students will attend the seminar with protection equipment, materials made available to them before each laboratory or the course notes referring to the seminar topic.</li> </ul>

## 6. Specific competencies acquired

Professional competencies	<ul style="list-style-type: none"> <li>Definition of notions, concepts, theories and advanced models in the field of forensic chemistry as well as their proper use within the professional community.</li> <li>Application and interpretation of the properties of organic compounds as well as concepts, approaches and phenomena related to forensic chemistry</li> <li>Identification and proper usage of concepts, method and theories for solving new complex problems of forensic chemistry.</li> <li>Use of advanced knowledge in the field of chemistry and structural analysis to determine, explain and interpret the structure and the toxicity of bioorganic compounds</li> <li>Critical analysis and usage of principles, methods and advanced work techniques to solve specific problems of forensic chemistry.</li> </ul>
Transversal competencies	<ul style="list-style-type: none"> <li>Analysis, interpretation and communication of scientific information and comply with professional ethics and moral</li> <li>Planning, monitoring and assuming professional duties of underline group. Proving the coordination capabilities, analytical thinking, adaptability and flexibility, team work abilities.</li> <li>Self-evaluation of professional performances and establish the needs of continuous learning, documentation in the work fields in correlation to the labour market</li> </ul>

## 7. Objectives of the discipline (outcome of the acquired competencies)

7. General objective of the discipline	<ul style="list-style-type: none"> <li>Familiarize students with the basics notions, concepts and techniques used in the identification, structural characterization and reactivity of major organic compounds in biological systems and other biological relevant organic compounds.</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>Developing the capacity of analysis and interpretation of chemical reactions that occur in biological systems.</li> <li>Advanced knowledge on the chemistry of organic compounds in biological systems (bioorganic compounds, heterocycles and natural compounds), rational nomenclature, structural characterization, physical and spectral properties, methods of preparation, reactivity.</li> <li>Application of the principle of organic structural analysis (NMR, MS, IR, UV VIS, Circular Dichroism, Fluorescence) for the investigation of bioorganic compounds; spectral determination of the structure of some relevant examples.</li> <li>Familiarize students with the concepts mentioned above; explaining the chemical properties of the bioorganic and biological relevant compounds, use of the theoretical concepts in solving practical problems</li> </ul>

## 8. Content

8.1. Course	Teaching methods	Remarks
8.1.1.-8.1.2 Correlation of the structure of organic and bioorganic compounds with reactivity and properties – general concepts.	Presentation; Explanation, Conversation; Description; Debate	
8.1.3.-8.1.5 Bioorganic compounds: proteins, nucleic acids,	Presentation; Explanation,	

oligosaccharides, lipids.	Conversation; Description; Debate	
8.1.6 - 8.1.7. Synthetic organic compounds and natural organic compounds with biological activity.	Presentation; Explanation, Conversation; Description; Debate	
8.1.8 - 8.1.10 Methods of isolation and identification of organic compounds (i.e. alkaloids, flavonoids, vitamins) and bioorganic compounds from complex biological mixtures using spectroscopic methods.	Presentation; Explanation, Conversation; Description; Debate	
8.1.11-8.1.12. Chemical modification of biomolecules. Study of the molecular interactions using high throughput techniques.	Presentation; Explanation, Conversation; Description; Debate	
8.1.13. Molecular recognition and affinity: the interaction of organic compounds – bioorganic compounds.	Presentation; Explanation, Conversation; Description; Debate	
8.1.14. Toxicity of organic compounds. Toxophoric and potentially toxophoric groups.	Presentation; Explanation, Conversation; Description; Debate	

### Bibliography

1. Suport de curs in format pdf, pus la dispozitia studentilor de catre titularul de disciplina
2. A. Miller and J. Tanner Essentials of Chemical Biology - Structure and Dynamics of Biological Macromolecules, JohnWiley & Sons Ltd, 2005
3. D. Van Vranken and G. Weiss Introduction to Bioorganic Chemistry and Chemical Biology, Garland Science, Taylor & Francis Group, 2013.
4. Shinji Funayama, Geoffrey A. Cordell Alkaloids: A Treasury of Poisons and Medicines, Elsevier Science, 2014.
5. Amit Kumar Nayak, Dilipkumar Pal, Bioactive Natural Products for Pharmaceutical Applications, Springer International Publishing, 2020
6. Review-uri si articole din literatura recenta. Grupul de publicatii Wiley, ACS, RCS, Elsevier

8.2 Seminar / Laboratory	Teaching methods	Remarks
8.2.1. Safety rules. Presentation of the laboratory objectives, bibliography and worksheet.	Conversation, Learning by discovery, Problem solving.	For efficiently the seminar/laboratory is organized in 7 sessions of 4 hours
8.2.2. DNA extraction/Isolation from tomatoes. DNA hydrolysis.	Experiments, Conversation, Learning by discovery, Problem solving	
8.2.3. Isolation of casein and lactose from milk. MS and MS/MS analysis of lactose.	Experiments, Conversation, Learning by discovery, Problem solving	
8.2.4. Forensic analysis of an analgesic (aspirin, acetaminophen, ibuprofen)	Experiments, Conversation, Learning by discovery, Problem solving	
8.2.5. Structural analysis (MS, NMR, IR, UV-Vis) of some controlled organic compounds.	Conversation, Learning by discovery, Problem solving	
8.2.6. Isolation of Hesperidin from Orange Peel	Experiments, Conversation, Learning by discovery, Problem solving	
8.2.7. Isolation of Alkaloids from Plant Sources (Hydrastine, Berberine or Caffeine)	Experiments, Conversation, Learning by discovery, Problem solving	

### Bibliography

1. R. M. Silverstein, F. X. Webster, D. J. Kiemle "Spectrometric Identification of Organic Compounds", Wiley, New-York, 2005.
2. Anumukonda, L. N.; Young, A.; Lynn, D. G.; Buckley, R.; Warrayat, A.; Graves, C. L.; Bean, H. D.; Hud N. V. J. Chem. Educ. 2011, 88, 1698–1701;
3. L. N.; Young, A.; Lynn, D. G.; Buckley, R.; Warrayat, A.; Graves, C. L.; Bean, H. D.; Hud N. V. J. Chem. Educ. 2011, 88, 1698–1701.
4. Charles Dickson Experiments in Pharmaceutical Chemistry - second edition, CRC Press, 2014.

**9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program**

- Acquirement of the theoretical and practical concepts of **Organic Compounds in Biological Systems** course will provide the students with the competences according to the Diploma Supplement and ANC qualifications.

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the final grade (%)
10.4 Curs	Correctness of answers – proper understanding and learning of notions and concepts discussed during lectures; Correct use of learned concept within new contexts.	Written examination. Proven or intended fraud is punished according to the ECST rules of UBB.	75%
	Correct solving of the problems as part of the examination subjects		
10.5 Seminar/laborator	Correctness of answers – proper understanding and learning of notions and concepts discussed during lectures; Correct use of learned concept within new contexts.	Continuous assessment Evaluated by means of problems to be solved,	25%
	Preparation of the worksheets (experimental procedure, identification of the products)	Laboratory report - delivered at the end of each session	
	Performing correct and safely experiments	Activity in the laboratory	
10.6 Minimum performance standards			
<ul style="list-style-type: none"><li>• Grade 5 (five) at the written exam, participation to the final written exam is conditioned by participation to all laboratory classes and minimum grade 5 (five) for the lab work.</li><li>• Adequate knowledge and usage of basic concepts used in the characterization and reactivity of bioorganic compounds</li></ul>			

Date

12.04.2024

Signature of course coordinator

Prof. Dr. Niculina Hadade

Signature of seminar coordinator

Prof. Dr. Niculina Hadade

Date of approval

16.04.2024

Signature of the head of department

Prof. Dr. Monica Toşa