COURSE DESCRIPTION

Chapters of medicinal biochemistry and drug design

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Babeș-Bolyai University
1.2. Faculty	Chemistry and Chemical Engineering
1.3. Department	Chemistry
1.4. Field	Chemistry
1.5. Level of study	Master
1.6. Degree programme / Qualification	Chemical biology in life and medical sciences
1.7. Form of education	Full-time education

2. Course-related data

2.1. Course title	**Chapters of medicinal biochemistry and drug design**			Course code	**CME6535**
2.2. Course coordinator	Dr. Jürgen BRÉM				
2.3. Seminar coordinator	Dr. Jürgen BRÉM/Dr. Dragos HORVATH				
2.4. Year of study	1	2.5. Semester	2	2.6. Type of assessment	Exam
2.7. Course status	Compulsory			2.8. Course type	Core subject

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

3.1. Hours per week	**3**	of which: 3.2 course	**2**	3.3 seminar	**1**
3.4. Total hours in the curriculum	42	of which: 3.5 course	28	3.6 seminar	**14**
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
3.5.1. Learning using manual, course support, bibliography, course notes (SA)					20
3.5.2. Additional documentation (in libraries, on electronic platforms, field documentation)					20
3.5.3. Preparation for seminars/labs, homework, papers, portfolios and essays					20
3.5.4. Tutorship					20
3.5.5. Evaluations					4
3.5.6. Other activities:					--
3.7. Total individual study hours	**84**				
3.8. Total hours per semester	**126**				
3.9. Number of ECTS credits	**5**				

4. Prerequisites (where applicable)

4.1. curriculum-related	
4.2 skills-related	

5. Specific conditions (where applicable)

5.1. for the course	• Video logistic support, MS Teams platform, Teaching board • Students will not use mobile phones during the course
5.2. for the seminar /lab activities	• The deadline for submitting assignment results will be agreed upon between the seminar/laboratory coordinator and the students. Delays will not be accepted unless justified by valid reasons. • In the case of late submission, the grade will be penalized by 0.5 points per

	day of delay.

6.1. Competencies resulting from the completion of the degree programme *(as referred to in the curriculum)*[1]

Professional competencies	
Competency code	**Competency**
PC1	Formulating solutions for solving complex issues of biochemistry and applications of chemistry and its methods and tools in biological systems based on the knowledge and application of advanced concepts, methods from the field of biochemistry, genetics, molecular biology, and bioinformatics.
PC3	Rational drug design & development, drug metabolism and metabolite identification.
PC5	Biomedical therapies based on small- and medium-sized molecules.
Transversal competencies	
Competency code	**Competency**
TC3	Designing, planning and performing an individual scientific, multidisciplinary research project.

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)[2]

Learning outcomes targeted by the subject		
Competency code	**Knowledge and comprehension**	**Specific academic skills**
CP1, CP2, CP6	1. Knowledge on complex issues of biochemistry and applications of chemistry and it's methods and tools in biological systems based on knowledge, identification and application of advanced concepts, methods, and theories in the field of biochemistry.	1. Application of modern chemical and biochemical methods and techniques in the study of biological systems
CP3, CP5, CP6	2. Knowledge on rational drug development, drug metabolism and metabolite identification, biomedical therapies based on small- and medium-sized molecules	2. Creative use of knowledge for the development of bioactive compounds, based on the mechanism of action at molecular level.
CT3	3. Designing, planning and performing an individual personal scientific research project by integrating knowledge of biochemistry.	3. Managing and transforming work or study situations that are complex, unpredictable, and require new strategic approaches.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. Understanding the interactions between drugs and living organisms, including molecular mechanisms and pharmacokinetics/pharmacodynamics. Understanding biological targets (proteins, nucleic acids) involved in diseases.
2. Knowledge of the principles of synthesis and optimization of bioactive molecules.
3. Knowledge of processes in the pharmaceutical industry: identifying and validating targets for new drugs, the lifecycle of a drug – discovery, clinical testing, and approval – as well as pharmaceutical regulations.

[1] The professional and/or transversal skills targeted by the subject for which the course description is prepared will be copied from the curriculum of the degree programme. For each competency, the complete entry, including the competency code, will be copied with the exact wording that appears in the curriculum, without any changes. If no competency is copied from either of the two categories, the row corresponding to that category is deleted from the table.

[2] The learning outcomes relevant for the degree programme and targeted by the subject for which the course description is prepared will be listed. The entries, copied without any changes from the Curriculum by subject type (Core Subject/Specialisation Subject/Complementary Subject), are listed under the corresponding competency.

4. Understanding analytical methods used in drug discovery.
Specific academic skills
1. Ability to use the workflow and techniques used in drug discovery, knowledge about the ADMET properties of drugs, toxicity, pharmacokinetics, pharmacodynamics.
2. Ability to use databases and computational tools for biological data analysis and molecular modelling, basic concepts and theories in drug design

8. Contents

8.1 Course	Teaching methods	Remarks
8.1.1. Introduction. The starting point: The patients are waiting	Lecture giving, explanation, conversation, exemplification, debate	
8.1.2. Drug discovery general overview	Lecture giving, explanation, conversation, exemplification, debate	
8.1.3. Biochemical techniques in drug discovery	Lecture giving, explanation, conversation, exemplification, debate	
8.1.4. Biophysical techniques in drug discovery	Lecture giving, explanation, conversation, exemplification, debate	
8.1.5. Fragment-based drug discovery	Lecture giving, explanation, conversation, exemplification, debate	
8.1.6. Target validation, hit finding and validation	Lecture giving, explanation, conversation, exemplification, debate	
8.1.7. Hit to lead and lead optimization	Lecture giving, explanation, conversation, exemplification, debate	
8.1.8. Precilinical tox and clinical stages	Lecture giving, explanation, conversation, exemplification, debate	
8.1.9. Drug absorbtion, distribution, metabolism and excretion	Lecture giving, explanation, conversation, exemplification, debate	
8.1.10. Pharmacokinetics and drug safety	Lecture giving, explanation, conversation, exemplification, debate	
8.1.11. Pharmakodynamics	Lecture giving, explanation, conversation, exemplification, debate	
8.1.12. Different modalities for assessing toxicity issues	Lecture giving, explanation, conversation, exemplification, debate	
8.1.13. Case study beta lactamase inhibitors	Lecture giving, explanation, conversation, exemplification, debate	
8.1.14. Case stdy: protein protein interaction to find novel antibiotics	Lecture giving, explanation, conversation, exemplification, debate	

Bibliography

- *Drug Design: Principles and Applications*, Ed. Abhinav Grover, Springer, 2017, ISBN 978-981-10-5187-6.
- *Textbook of Drug Design and Discovery*, Ed. Povl Krogsgaard-Larsen, Tommy Liljefors, Ulf Madsen, Taylor & Francis, 2002, ISBN 0-203-34560-6.
- *Drug Design Structure- and Ligand-Based Approaches*, Ed. Kenneth M. Merz, Jr, Dagmar Ringe, Charles H. Reynolds, Cambridge University Press, 2010, ISBN 9780511730412.

8.2. Seminar		
8.2.1. General principles. Drug design rules.	Explanation, conversation, problematization	
8.2.2.-8.2.4 Build up of a pharmacophore model	Modeling, explanation, conversation, problematization	
8.2.5. -8.2.6 Determination of binding constants between ligand and protein	Explanation, conversation, problematization	
8.2.7.Protein-protein interaction characterizations	Explanation, conversation, problematization	
8.2.7. Verification test	Verification test	
Bibliography • *Drug Design Structure- and Ligand-Based Approaches*, Ed. Kenneth M. Merz, Jr, Dagmar Ringe, Charles H. Reynolds, Cambridge University Press, 2010, ISBN 9780511730412.		

9. Evaluation

Type of activity	9.1 Evaluation criteria[3]	9.2 Evaluation methods[4]	9.3 Percentage in the final grade
9.4. Course	Understanding, assimilating and knowing the information content. The ability to use the information in a new context. Knowing the information content. The ability to use the information in a new context both theoretically and practically.	Ora Exam – Access to the exam is conditional on completing the laboratory test and submitting the corresponding laboratory reports for all practical work. Any attempt at cheating during the exam will result in disqualification from the exam. Exam fraud is punishable by expulsion, in accordance with the ECTS regulations of UBB.	60%
9.5 Seminar	Correctness of answers – correct acquisition and understanding of the issues dealt with at the seminar The activity carried out during the seminar sessions, the correctness of the homework carried out	Homework will be sent until the last week of teaching activities. The seminar test is held in the last week of teaching activity.	40%
9.6 Minimum standard for passing			
✓ Minimum condition for passing the exam: grade 5 (five) in the laboratory and seminar tests and grade 5 (five) in the exam.			

10. SDG labels (Sustainable Development Goals)[5]

	○	Sustainable Development Generic Label

[3] The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

[4] Both final evaluation methods and ongoing evaluation strategies should be established.

[5] Select a single label which, according to the *Implementation of SDG labels in the academic process*, best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: *"No label applies."*

								
○	○	◉	◉	○	○	○	○	◉
								No label applies
○	○	○	○	○	○	○	○	○

Date of entry:
22.04. 2026

Signature of course coordinator

Dr. Jürgen BRÉM

Signature of seminar coordinator

Dr. Jürgen BRÉM/Dr. Dragos HORVATH

Date of approval in the department:
24.06.2026

Signature of the head of department
Prof. Dr. Eng. Monica Ioana TOŞA