

COURSE DESCRIPTION

Applied Biochemistry

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Babeş-Bolyai University, Cluj-Napoca
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	Food Control and Security (CSA)/Chemist
1.7. Form of education	Full-time

2. Course-related data

2.1. Course title	Applied Biochemistry			Course code	CME8125
2.2. Course coordinator	Prof. Dr. Radu Silaghi-Dumitrescu				
2.3. Seminar coordinator	Prof. Dr. Radu Silaghi-Dumitrescu				
2.4. Year of study	I	2.5. Semester	2	2.6. Type of assessment	Progress check
2.7. Course status	Optional			2.8. Course type	Specialisation subject

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

3.1. Number of hours per week	4	of which: 3.2. course	2	3.3. seminar/ laboratory/ project	2
3.4. Total of hours in the curriculum	56	of which: 3.5. course	28	3.6. seminar/ laboratory	28
Time allocation for individual study (IS) and self-taught activities (ST)					69 hours
Learning from textbooks, course materials, bibliography, and notes (IS)					20
Additional research in the library, on subject-specific electronic platforms, and on-site					20
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					15
Tutoring (professional guidance)					10
Examinations					4
Other activities					0
3.7. Total hours of individual study (IS) and self-taught activities (ST)				69	
3.8. Total hours per semester				125	
3.9. Number of credits				5	

4. Prerequisites (where applicable)

4.1. curriculum-related	Not applicable
4.2. skills-related	Not applicable

5. Specific conditions (where applicable)

5.1. course-related	<ul style="list-style-type: none"> • A room equipped with a video projector is required • Students must attend the class with their mobile phones turned off • Late arrivals will not be accepted
5.2. seminar/laboratory-related	<ul style="list-style-type: none"> • The student must be familiar with the principles of seminars and have prepared an outline of the seminar to be discussed • Students must attend the seminar with their mobile phones turned off

	<ul style="list-style-type: none"> • Students will present themselves in the laboratory with a lab coat, gloves, laboratory cloth.
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6.1. Competencies resulting from the completion of the degree programme (as referred to in the curriculum)¹

Professional competencies	
Competency code	Competency
CP2	Analyzes chemical samples
CP6	Conducts scientific research
Transversal competencies	
Competency code	Competency
CT1	Gestioneaza dezvoltarea profesionala personala Manages personal professional development

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
CP2, CP6	1. The student/graduate explains the practical applications of biochemistry in food, clinical and pharmaceutical analyses.	1. The student/graduate applies quantitative and qualitative biochemical tests on biological and food samples.
CP2, CP6	2. The student/graduate describes the principles of enzymatic and immunochemical methods used in applied contexts.	2. The student/graduate carries out applied research based on biochemical techniques and interprets the results.

7. Subject-specific learning outcomes

Knowledge and comprehension
4. Understands the structure and function of the main components of a research project and a scientific manuscript: the current state of knowledge, objectives, methodology, results, conclusions, and scientific presentation.
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4. Understands the structure and function of the main components of a research project and a scientific manuscript: the current state of knowledge, objectives, methodology, results, conclusions, and scientific presentation.
Specific academic skills
1. Applies quantitative and qualitative biochemical tests on biological, food or pharmaceutical samples.
2. Uses specific analytical instruments (spectrophotometers, enzymatic analyzers) for biochemical determinations.
3. Evaluates the validity of biochemical methods and ensures quality control of the results.

8. Contents

8.1. Course	Teaching and learning methods	Remarks ³
8.1.1. Carbohydrate metabolism, normal and pathological. Carbohydrates,	Lecture	2 hours

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 to 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.

³ For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

digestion and absorption of carbohydrates. Glycolysis, Gluconeogenesis. Glycogenolysis, glycogen synthesis. Glycemic homeostasis.	Explanation Conversation	
8.1.2. Carbohydrate metabolism, normal and pathological. The pentose-phosphate pathway. The tricarboxylic acid cycle. Oxidative phosphorylation. Electron conveyor chain; redox components, transfer through fixed and mobile components. Mechanism of ATP production	Lecture Explanation Conversation	2 hours
8.1.3. Carbohydrate metabolism, normal and pathological. Diseases associated with carbohydrate metabolism: pathogenesis, diagnosis, analytical methods, treatment.	Lecture Explanation Conversation	2 hours
8.1.4. Normal and pathological lipid metabolism. Lipids, digestion and absorption of lipids, lipids – sources of energy. Lipoproteins, chylomicrons, VLDL, LDL, HDL, role, properties. Fat storage	Lecture; Explanation Conversation	2 hours
8.1.5. Normal and pathological lipid metabolism. Fatty acid catabolism. Biosynthesis of fatty acids. ROS toxicity, atherosclerosis. Ethanol metabolism	Lecture; Explanation Conversation; Description	2 hours
8.1.6. Biosynthesis of complex lipids. Metabolism of cholesterol, lipoproteins, steroid hormones.	Lecture; Explanation Conversation; Description	2 hours
8.1.7. Normal and pathological protein metabolism. Proteins, digestion, absorption, specificity as forms of expression of genetic information, functions, synthesis, transport, degradation	Lecture; Explanation Conversation; Description	2 hours
8.1.8. Normal and pathological protein metabolism. Metabolism of amino acids, metabolites, clinical significance of changes, urea cycle.	Explanation; Conversation; Description; Problematicization; Debate;	2 hours
8.1.9. Nucleotide metabolism: biosynthesis and degradation of nucleotides, associated diseases, antineoplastic agents.	Lecture; Explanation Conversation; Description; Problematicization; Debate;	2 hours
8.1.10. The process of DNA replication.	Lecture; Explanation of the conversation; Description; Problematicization; Debate;	2 hours
8.1.11. Mutagenicity. Mechanisms. Mutagen agents. Reparative mechanisms.	Lecture; Explanation Conversation; Description; problematicization;	2 hours
8.1.12. Polymerase chain reaction (PCR) and its applications in clinical biochemistry.	Lecture; Explanation Conversation; Description; problematicization;	2 hours
8.1.13. Immunochemical methods in clinical diagnosis: antigen-antibody	Explanation; Conversation; Description; Problematicization;	2 hours

interaction, production of antibodies, immunochemical methods (ELISA)	Debate;	
8.1.14. Immunochemical methods in clinical diagnosis: antigen-antibody interaction, antibody production, immunochemical methods (immunoturbidimetric methods)	Explanation; Conversation; Description; Problematization; Debate;	2 hours
Bibliography		
<ol style="list-style-type: none"> 1. Irimie F.D., Elemente de Biochimie, I, II, Erdely Hirado Cluj 1998. 2. Garrett R.H, Grisham C.M. Biochemistry, 5th edition, ISBN-13: 978-1133106296, 2013 3. Berg M. J., Tymoczko J. L., Stryer L., Biochemistry, 7th edition, ISBN-10: 1429229365, 2012. 4. Suport de curs 5. Silaghi-Dumitrescu R., Cioloboc D., Árkosi M. K., Tomoioga N., Metals in living systems, 2024, Presa Universitara Clujeana, Cluj-Napoca, ISBN 978-606-37-1937-0 		
8.2. Seminar/ laboratory	Teaching and learning methods	Remarks
8.2.1. Protein analysis by the chromatographic methods.	Explanation; Conversation; Description; Problematization;	
8.2.2. Amplification of a gene of interest by the PCR reaction.	Explanation; Conversation; Description; Problematization;	
8.2.3. DNA separation by agarose gel electrophoresis.	Explanation; Conversation; Description; Problematization;	
8.2.4. Modern biochemical techniques in the clinical laboratory – ELISA, immunoprecipitation, etc.	Experiment; Explanation; Conversation; Description; Problematization;	
8.2.5. Modern biochemical techniques in the clinical laboratory – HPLC, HPLC-MS, Western-blot, applications of fluorescent spectrophotometry	Experiment; Explanation; Conversation; Description; Problematization;	
Bibliography		
<ol style="list-style-type: none"> 1. Filip, A., Bencze, L.C. Advanced Biochemistry, Practical Papers, Napoca Star Publishing House, 2017 2. Course support 		

9. Evaluation





























Type of activity	9.1 Evaluation criteria ⁴	9.2 Evaluation methods ⁵	9.3 Percentage in the final grade
9.4 Course	Correctness of responses – mastering and correctly understanding the issues addressed in the course	Written exam – access to the exam is conditioned on obtaining a minimum grade of 5 at the seminar test. Intent to commit fraud during the exam will result in elimination from the exam. Exam fraud is penalized by expulsion in accordance with the UBB ECST regulations.	80 %
9.5 Seminar/laboratory	Correctness of responses – mastering and correctly understanding the issues addressed in the seminar	Seminar written test	20 %
9.6 Minimum standard for passing			
<ul style="list-style-type: none"> • A grade of 5 (five) on both the exam according to the grading rubric and the final average. 			

⁴ 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.

⁵ Both final evaluation methods and ongoing evaluation strategies should be established.

- Knowledge of the introductory notions to the processes of metabolism. Knowledge of the normal and pathological conditions of metabolic processes. Knowledge of the interconnections and regulation of metabolic processes.

10. SDG labels (Sustainable Development Goals)⁶

		Sustainable Development Generic Label						
								
								No label applies
								

Date of entry:
21.04.2026

Signature of course coordinator
Prof. Dr. Radu Silaghi-Dumitrescu

Signature of seminar coordinator
Prof. Dr. Radu Silaghi-Dumitrescu

Date of approval in the department:
24.04.2026

Signature of the head of department
Prof. Dr. Monica Toșa

⁶ 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.”