

## SYLLABUS

Academic year 2023 - 2024

### 1. Details about the program

1.1. Higher Education Institution	„Lucian Blaga” University of Sibiu
1.2. Faculty	Faculty of Sciences
1.3. Department	Environmental Sciences, Physics, Physical Education and Sports
1.4. Field of study	Biology
1.5. Study cycle <sup>1</sup>	Bachelor
1.6. Specialization	Biology

### 2. Details about the course

2.1. Course name	BIOCHEMISTRY			Code	FSTI.MFE.BIOEN.L.F O.3.2020.E-4.4
2.2. Course coordinator	Prof. univ. dr. Oancea Simona				
2.3. Practical activity coordinator	Prof. univ. dr. Oancea Simona				
2.4. Year of study <sup>2</sup>	2	2.5. Semester <sup>3</sup>	1	2.6. Type of assessment <sup>4</sup>	E
2.7. Type of discipline <sup>5</sup>	O	2.8. Formative category of the discipline <sup>6</sup>	F		

### 3. Estimated total time

3.1. Proportion of the discipline within the curriculum – <i>number of hours / week</i>					
3.1.a.Lecture	3.1.b. Seminar	3.1.c. Laboratory	3.1.d. Project	3.1.e Other	Total
2	-	2	-	-	4
3.2. Proportion of the discipline within the curriculum – <i>number of hours / week</i>					
3.2.a.Lecture	3.2.b. Seminar	3.2.c. Laboratory	3.2.d. Project	3.2.e Other	Total <sup>7</sup>
28	-	28	-	-	56
<b>Allocation of time budget for individual study<sup>8</sup></b>					<b>No. hours</b>
Study based on textbook, lecture notes, bibliography and course notes					14
Additional research: library, specialized electronic platforms and field or on-site investigation and documentation					10
Preparing for the seminar / laboratorires, home assignments, reports, portfolios and essays					10
Tutoring <sup>9</sup>					
Examinations <sup>10</sup>					10
<b>3.3. Total number of hours for individual study<sup>11</sup> (NOSI<sub>sem</sub>)</b>					<b>44</b>
<b>3.4. Total number of hours in the curriculum (NOAD<sub>sem</sub>)</b>					<b>56</b>
<b>3.5. Total number of hours per semester<sup>12</sup> (NOAD<sub>sem</sub> + NOSI<sub>sem</sub>)</b>					<b>100</b>
<b>3.6. No of hours / ECTS</b>					<b>25</b>
<b>3.7. Number of credits<sup>13</sup></b>					<b>4</b>

#### 4. Prerequisites (if applicable)

4.1. Prerequisite courses for enrollment to this subject (from the curriculum) <sup>14</sup>	General chemistry
4.2. Competencies	Identifying classes and chemical structure of organic compounds and groups of ions

#### 5. Requirements (wherever applicable)

5.1. Lecture organization and structure <sup>15</sup>	Conditions for active learning and interactive learning activities; Course hall / amphitheater, educational means (PC, slide projection), teaching materials: PowerPoint presentation, traditional blackboard and chalk
5.2. Organization and structure of practical activities (lab/sem/pr/other) <sup>16</sup>	Conditions for practical approach; Laboratory, Biochemistry laboratory facilities (hood, chemical reagents, storage cupboards, glassware, specific equipment specific for biochemical analyses, lab reports)

#### 6. Specific competencies<sup>17</sup>

		Number of credits assigned to the discipline <sup>18</sup>	Distribution of credits according to competencies <sup>19</sup>
<b>6.1. Professional competencies</b>	CP1	Understanding the biochemical specific terms, identifying relationships and correlations between chemical structure and biological activity of biomolecules	
	CP2	Description and appropriate use of domain-specific concepts related to the structure, properties and transformations of chemical components in the environment and living organisms	
	CP3	Application, transfer and problem solving in the field	
	CP4	Practical skills for carrying out laboratory tests on chemicals and biomolecules	
	CP5	PC operating skills for designing reports, reactions schemes and publishing research papers	
<b>6.2. Transversal competencies</b>	CT1	Implementation of strategies of perseverance, accuracy, efficiency and work responsibility, punctuality and personal accountability for work results, creativity, good sense, analytical and critical thinking, problem solving, etc., based on principles, rules and values of professional ethics code in the field.	
	CT2	Effective use of various ways and techniques of learning - training for the acquisition of information and electronic bibliographic databases, both in Romanian and in an international language	
	CT3	Capacity development of interactivity, teaching tasks required to achieve satisfaction development to respond to questions and issues raised during the course and laboratory activities	

#### 7. Course objectives (reflected by the framework of specific competencies)

7.1. General objective	The course "Biochemistry" aims at students' acquirement of integrated knowledges needed for the study of next disciplines, closely linked to the objectives of the program.
7.2. Specific objectives	By the end of the course, the students should be able to demonstrate advanced knowledge and understanding in the following core areas: <ul style="list-style-type: none"> <li>composition of living matter: bioelements and biomolecules (sugars, lipids, proteins, enzyme and their kinetics, nucleic acids, vitamins, hormones).</li> </ul>

	<ul style="list-style-type: none"> <li>• Background of biochemical aspects of essential biocomponents.</li> <li>• Different types of biochemical intra- and inter-communication, in animals and plants.</li> <li>• Ability of using the methods of analysis and isolation of chemical compounds from biological samples.</li> <li>• Capacity to systemically address biochemical methods depending on the analyte, the assay sensitivity, availability and results.</li> <li>• Communication skills using language specific concepts.</li> </ul>
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## 8. Course description

8.1. Lecture <sup>20</sup>	Teaching methods <sup>21</sup>	No. of hours
Lecture 1 The objective of biochemistry. The interdisciplinary character of biochemistry and application areas. Ecological Biochemistry. Molecular and macromolecular organization of living matter: bioelements and biomolecules. The role and functions of water and mineral salts in plant and animal organisms.	Frontal activity, Interactive teaching, videoprojection, online	2
Lecture 2 The structure, functions and eco-biochemical implications of the major chemical constituents of living matter: Sugars-structure and biochemical properties. Toxic glycosides in plants. Glycosylation and glucuronidation as defense mechanisms of plants and animals against environmental toxic substances.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 3 Oligosaccharides and polysaccharides.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 4 Lipids: structure and functions of simple lipids. The role of unsaturated fatty acids in aquatic ecosystems.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 5 Lipids: structure and functions of complex lipids.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 6 Structure, properties and biological role of protein and non-protein amino acids.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 7 Biosynthesis, properties of peptides. Natural and synthetic peptides.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 8 Structure and functions of proteins. Hydrolysis of proteins. Representatives.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 9 Nucleic acids: structure, functions and properties of DNA and RNA.	Frontal activity, in groups, individual, schemes,	2

	explanation, Interactive teaching, videoprojection, online	
Lecture 10 Enzymes: Structure and mechanism of action of enzymes. Representatives.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 11 Enzymatic catalysis. The kinetics of enzymatic reactions.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 12 Water-soluble and fat-soluble vitamins	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 13 Hormones: Structure and function of plant hormones. Phytoestrogens.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
Lecture 14 Biochemical communication within the same species: Survival strategies of plants in the ecosystem (allelopathy). Biochemical communication through pheromones in insects. Biochemical interactions between species.	Frontal activity, in groups, individual, schemes, explanation, Interactive teaching, videoprojection, online	2
<b>Total number of lecture hours:</b>		<b>28</b>

<b>8.2. Practical activities</b> (8.2.a. Seminar <sup>22</sup> / 8.2.b. Laboratory <sup>23</sup> / 8.2.c. Project <sup>24</sup> / 8.2.d. Other practical activities <sup>25</sup> )	<b>Teaching methods</b>	<b>No. of hours</b>
Act.1 Laboratory safety issues. Laboratory equipment.	Discussion, presentation of the laboratory	2
Act.2 Weighing of samples. Volume measurement, measurement errors.	laboratory experiments	2
Act.3 Preparation of solutions - theory and practice. Concentrations. Numerical exercises.	laboratory experiments	2
Act.4 Extraction and analysis methods of biocompounds.	laboratory experiments	2
Act.5 Identification of carbohydrates from natural extracts.	laboratory experiments	2
Act.6 Identification of carbohydrates from unknown sample.	laboratory experiments	2
Act.7 Components analysis of simple and complex lipids.	laboratory experiments	2
Act.8 Determination of characterization indices of lipids.	laboratory experiments	2
Act.9 Identification of amino acids and proteins from plant and animal sources.	laboratory experiments	2
Act.10 Methods for protein separation.	laboratory experiments	2
Act.11 Modern techniques for protein analysis (chromatography, electrophoresis).	laboratory experiments	2
Act.12 Identification of vitamins from plant sources.	laboratory experiments	2
Act.13 Determination of activity of diverse enzymes.	laboratory experiments	2
Act.14 Test knowledge of biochemistry lab.	laboratory experiments	2
<b>Total number of hours: seminar/laboratory</b>		<b>28</b>

## 9. Bibliography

9.1. Recommended references	Oancea Simona, Biochemistry, course, electronic version
	Oancea Simona, CHAPTER 4 "Natural extracts. Extraction methodologies – conventional and modern techniques", pp. 39-53, in "Advanced health-improved textile composites", LAP Lambert Academic Publishing OmniScriptum GmbH & Co. KG, 2017, ISBN 978-3-330-00480-1.
	Oancea Simona, CHAPTER 1 "Structure, properties, metabolism and biological role of macronutrients (proteins, lipids and carbohydrates)", pp. 1-30, in "Foods that harm, foods that promote health: A biochemical and nutritional perspective" Hulea S.A and M. Ahmadi (Editors), 315 pages, Universal Publisher, BrownWalker Press, Inc. California, USA, 2021.
	Oancea Simona, Biochimie ecologică, Editura Alma Mater, Sibiu, 2007.
	Oancea Simona, Căi metabolice primare în sistemele biologice, Editura Universității "Lucian Blaga" Sibiu, 2005.
	Oancea S., Tehnici clasice și moderne de analiză biochimică, Editura Universității "Lucian Blaga" Sibiu, Romania, 2021.
9.2. Additional references	BAYNES, John W. & DOMINICZAK, Marek H., Medical biochemistry, 2005.
	HOBAL, Stefan, Biochemistry Course. Vol. I (2009) si Vol.II,/ (2010)
	Voet D., Voet J.G., Biochemistry, 1990
	Campbell P.N., Smith A.D., Biochemistry, 1988
	Lehninger A., Biochemistry, 1987.

## 10. Correlating the course description with the expectations and requirements of representatives of the epistemic community, professional associations and significant employers and stakeholders related to the study program and the specific area<sup>26</sup>

<ul style="list-style-type: none"> <li>The addressed content covers fundamental and applied topics of the discipline that familiarize students with discipline specific issues (concepts, theories, ideas, hypotheses, laws, principles and methods, research, critical analysis, innovation);</li> <li>Course curriculum is composed so as to facilitate the formation of professional skills (specific profession provided in documents RNCIS) and transversal competences;</li> <li>Course contents are addressed in an inter-, intra-, trans- and / or multidisciplinary way in order to stimulate initiative, independence of thought, critical analysis and creative thinking, underlying skills necessary for scientific research, professional and transversal competences necessary for the efficient and creative problems solving and new work situations;</li> <li>The contents addressed include recent topic (on local, national, international level) that is the subject of interest and / or discussions / research conducted by professional associations and / or employers.</li> </ul> <p>Course contents were selected as a result of collaboration with other teachers teaching in universities in the country and / or abroad, as a result of collaboration with business</p>
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## 11. Evaluare

Type of activity	11.1 Assessment criteria	11.2 Assessment methods		11.3 Percentage of the final grade	Notes. <sup>27</sup>
11.4a Exam / Coloquium	• Theoretical and practical knowledge (quantity, correctness, accuracy)	Midterm / ongoing assignments <sup>28</sup> :	15%	70% (minimum 5)	
		Home assignments:	%		
		Other activities <sup>29</sup> :	%		
		Final assessment:	85% (min.)		

			5)		
11.4b Seminar	<ul style="list-style-type: none"> <li>• Frequency/relevance of contributions or answers</li> </ul>	Proof of contributions, portfolio (scientific papers, syntheses)		% (minimum 5)	
11.4c Laboratory	<ul style="list-style-type: none"> <li>• Knowledge of equipment, methods of using specific instruments and tools; assessment of tools or achievements, processing and interpretation of results</li> </ul>	<ul style="list-style-type: none"> <li>• Written questionnaire</li> <li>• Oral examination</li> <li>• Laboratory notebook, experimental work, scientific papers, etc.</li> <li>• Practical demonstrations</li> </ul>		30% (minimum 5)	
11.4d Project	<ul style="list-style-type: none"> <li>• Quality of achieved project, accuracy of project documentation, rationale and evidence of selected solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Self-assessment, project submission and/or defense</li> <li>• Critical assessment of a project</li> </ul>		% (minimum 5)	
<p>11.5 Minimum performance standard<sup>30</sup>            Knowledge and correct classification of molecules in the class.            Knowledge of at least 2 biochemical properties of the main components of living matter.            Knowledge of at least 2 biological functions of specific bioconstituents and their practical applications.            Knowing biochemical methods of communication within and between species.</p>					

***The course description includes components adapted to SEN (Special Educational Needs) persons, according to their type and degree, at all curricular elements and dimensions (competencies, objectives, course description, teaching methods, alternative assessment), in view of providing and ensuring equitable and fair opportunities to academic education for all students, with special attention to special educational needs.***

Date of submission: |\_1\_|\_3\_| / |\_0\_|\_9\_| / |\_2\_|\_0\_|\_2\_|\_3\_|

Date of approval in the Department: |\_1\_|\_9\_| / |\_1\_|\_0\_| / |\_2\_|\_0\_|\_2\_|\_3\_|

	Degree, title, first name, surname	Signature
Course coordinator	Professor Simona Oancea, PhD	
Study program coordinator	Assoc. Prof. Ana-Maria Benedek-Sîrbu, PhD	
Director Departament	Lecturer Voichița GHEOCA PhD	



<sup>1</sup> Licență / Master

<sup>2</sup> 1-4 pentru licență, 1-2 pentru master

<sup>3</sup> 1-8 pentru licență, 1-3 pentru master

<sup>4</sup> Examen, colocviu sau VP A/R – din planul de învățământ

<sup>5</sup> Regim disciplină: O=Disciplină obligatorie; A=Disciplină opțională; U=Facultativă

<sup>6</sup> Categoria formativă: S=Specialitate; F=Fundamentală; C=Complementară; I=Asistată integral; P=Asistată parțial; N=Neasistată

<sup>7</sup> Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.2.a.b.c.d.e.)

<sup>8</sup> Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.37.

<sup>9</sup> Între 7 și 14 ore

<sup>10</sup> Între 2 și 6 ore

<sup>11</sup> Suma valorilor de pe liniile anterioare, care se referă la studiul individual.

<sup>12</sup> Suma (3.5.) dintre numărul de ore de activitate didactică directă (NOAD) și numărul de ore de studiu individual (NOSI) trebuie să fie egală cu numărul de credite alocate disciplinei (punctul 3.7) x nr. ore pe credit (3.6.)

<sup>13</sup> Numărul de credit se calculează după formula următoare și se rotunjește la valori vecine întregi (fie prin micșorare fie prin majorare)

$$\text{Nr. credite} = \frac{\text{NOCpSpD} \times C_C + \text{NOApSpD} \times C_A}{\text{TOCpSdP} \times C_C + \text{TOApSdP} \times C_A} \times 30 \text{ credite}$$

Unde:

- NOCpSpD = Număr ore curs/săptămână/disciplina pentru care se calculează creditele
- NOApSpD = Număr ore aplicații (sem./lab./pro.)/săptămână/disciplina pentru care se calculează creditele
- TOCpSdP = Număr total ore curs/săptămână din plan
- TOApSdP = Număr total ore aplicații (sem./lab./pro.)/săptămână din plan
- C<sub>C</sub>/C<sub>A</sub> = Coeficienți curs/aplicații calculate conform tabelului

Coeficienți	Curs	Aplicații (S/L/P)
Licență	2	1
Master	2,5	1,5
Licență lb. străină	2,5	1,25

<sup>14</sup> Se menționează disciplinele obligatoriu a fi promovate anterior sau echivalente

<sup>15</sup> Tablă, videoproiector, flipchart, materiale didactice specifice, platforme on-line etc.

<sup>16</sup> Tehnică de calcul, pachete software, standuri experimentale, platforme on-line etc.

<sup>17</sup> Competențele din Grilele aferente descrierii programului de studii, adaptate la specificul disciplinei

<sup>18</sup> Din planul de învățământ

<sup>19</sup> Creditele alocate disciplinei se distribuie pe competențe profesionale și transversale în funcție de specificul disciplinei

<sup>20</sup> Titluri de capitole și paragrafe

<sup>21</sup> Expunere, prelegere, prezentare la tablă a problematicii studiate, utilizare videoproiector, discuții cu studenții (pentru fiecare capitol, dacă este cazul)

<sup>22</sup> Discuții, dezbateri, prezentare și/sau analiză de lucrări, rezolvare de exerciții și probleme etc.

<sup>23</sup> Demonstrație practică, exercițiu, experiment etc.

<sup>24</sup> Studiu de caz, demonstrație, exercițiu, analiza erorilor etc.

<sup>25</sup> Alte tipuri de activități practice specifice

<sup>26</sup> Legătura cu alte discipline, utilitatea disciplinei pe piața muncii

<sup>27</sup> CPE – condiționează participarea la examen; nCPE – nu condiționează participarea la examen; CEF - condiționează evaluarea finală; N/A – nu se aplică

<sup>28</sup> Se va preciza numărul de teste și săptămânile în care vor fi susținute.

<sup>29</sup> Cercuri științifice, concursuri profesionale etc.

<sup>30</sup> Se particularizează la specificul disciplinei standardul minim de performanță din grila de competențe a programului de studii, dacă este cazul.