SYLLABUS [1]

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	"Politehnica" University from Timișoara
1.2 Faculty[2]/ Department [3]	Faculty of Industrial Chemistry and Environmental Engineering / Department of Applied Chemistry and Engineering and Natural Organic Compounds, CAICON
1.3 Chair	—
1.4 Field of study (name/code[4])	Chemical Engineering / 10.30.50
1.5 Study cycle	Licence
1.6 Study program (name/code/qualification)	Chemistry and engineering of organic compounds, petrochemicals and Carbochemistry / 10.30.50.20 Inorganic substances engineering and environmental protection / 10.30.50.10

2. Information about the discipline

2.1 Name of discipline/ formative category[5]			Biochemistry / DS				
2.2 Coordinator (holder) of course activities			Lecturer PhD eng. Milea Marius Silviu				
2.3 Coordinator (holder) of applied activities[6]			Lecturer PhD eng. Milea Marius Silviu				
2.4 Year of study[7]	II	**2.5** Semester	4	**2.6** Type of evaluation	D	**2.7** Type of discipline[8]	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [9]

3.1 Number of fully assisted hours / week	2 of which:	**3.2** course	1	**3.3** seminar / laboratory / project	1
3.1* Total number of fully assisted hours / semester	28 of which:	**3.2*** course	14	**3.3*** seminar / laboratory / project	14
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	1.86 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.29
		hours of individual study after manual, course support, bibliography and notes			1
		training seminars / laboratories, homework and papers, portfolios and essays			0.57
3.7* Number of hours of unassisted activities / semester	26 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			4
		hours of individual study after manual, course support, bibliography and notes			14
		training seminars / laboratories, homework and papers, portfolios and essays			8
3.8 Total hours / week [10]	3.86				
3.8* Total hours /semester	54				
3.9 Number of credits	2				

[1] The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.
[2] The name of the faculty which manages the educational curriculum to which the discipline belongs
[3] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[4] The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.
[5] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[6] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] Year of studies in which the discipline is provided in the curriculum.
[8] Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).
[9] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[10] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4. Prerequisites (where applicable)

4.1 Curriculum	• Organic chemistry, Structure and properties of molecules, Physical chemistry
4.2 Competencies	•

5. Conditions (where applicable)

5.1 of the course	• Video projection system; • Students will not attend at lectures and seminars with their mobile phones open. Also, telephone conversations will not be tolerated during classes or seminars and students will not leave classrooms or seminars to pick up personal phone calls; • Delay of students in the course and seminar will not be tolerated, this attitude proving disinterest in the educational process.
5.2 to conduct practical activities	•

6. Specific competencies acquired through this discipline

Specific competencies	• Description, analysis and use of the basic concepts and theories from engineering science field
Professional competencies ascribed to the specific competencies	• Description, analysis and use of the basic concepts and theories from chemistry and chemical engineering field • Description, analysis and use of the basic concepts on structure and reactivity of organic compounds
Transversal competencies ascribed to the specific competencies	• Performing the profesional tasks in accordance with the specified requirements and imposed time, with the rules of professional ethics and moral conduct, following a predetermined work plan and qualified guidance • Information and permanent documentation in its field of interest in Romanian and in a foreign language with the use of modern information and communication

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• The biochemistry course of the second year university is a general course addressed to all students who are studying chemical engineering, regardless of the field of specialization follow. The general aim of the discipline is to develop skills for understanding and using basic theories in the field of general biochemistry with direct implications in knowing the types of biomolecules and their metabolic pathways.
7.2 Specific objectives	• Using basic knowledge in the field of organic chemistry and physical chemistry to explain biochemical phenomena and processes; • Defining the notions, concepts, theories and basic models in the field of biochemistry and engineering; • Qualified analysis of the structural elements that define the biological activity of biomolecules.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. The molecular logic of living organisms; biomolecules and cells 1.1. The biomolecules and life 1.2. The axioms of molecular logic of living organisms 1.3. The water - universal metabolite, the role of water in organisms 1.4. The metabolic transformations of biomolecules: catabolism and anabolism; Types of metabolic reactions	1	Interactive presentation with video support for fixing, consolidating and systematizing of the knowledge, lecture - debate, debate, demonstration, problematization, case study, methods and techniques of cooperative learning.
2. Carbohydrates (sugars) 2.1. Definition, classification, biological role; 2.2. Monosaccharides: structure and configuration, isomerism, physical and chemical properties, interconversion reactions of sugars; the biological importance of pentoses and hexoses carbohydrates; General notions about metabolism 2.3. Disaccharides, trisaccharides and oligosaccharides 2.4. Structural (cellulose, chitin) and reserve/storage (starch, glycogen) polysaccharides	4	
3. Nucleotides and nucleic acids 3.1. The definition and the general structure of nucleic acids; 3.2. The heterocyclic bases (pyrimidine and purine) in nucleic acids; 3.3. Nucleosides and nucleotides; Nucleotides with coenzyme functions: nucleoside phosphates (ATP, ADP, AMP), pyridine nucleotides (NAD^+, $NADP^+$), flavin-adenine dinucleotide (FAD) and coenzyme A; 3.4. The structure, configuration and conformation of ribo- and deoxy-ribonucleic acids; their importance and biological role; 3.5. DNA, RNA, types, characteristics, importance, nucleic acid denaturation; 3.6. Protein biosynthesis and transcription of the nucleotide genetic code into amino acid code.	2	
4. Natural amino acids 4.1. The definition, structure and nomenclature of natural amino acids; protein and non-protein amino acids; 4.2. Chemical and biochemical methods for obtaining amino acids; 4.3. The physico-chemical properties of amino acids; the acid-base properties; 4.4. Amino acids with specific physiological functions, biogenic amines and natural amino alcohols.	2	
5. Peptides and proteins 5.1. Definition, primary, secondary, tertiary and quaternary structure; 5.2. Physical-chemical properties; 5.3. Methods of analysis; amino acid analysis, sequential analysis of amino acids in peptides and proteins; 5.4. Methods for the synthesis of peptides and proteins; protecting and activating amino and carboxylic groups in amino acids; solid phase peptide synthesis - Merrifield method; 5.5. Examples of biologically important peptides and proteins; complex proteins (proteins); 5.6. Enzymes: definition, classification, structure, mechanisms of action.	3	
6. Lipids and membranes 6.1. Definition, classification, biological role, nutritional and physiological importance; 6.2. Fatty acids: classification, structures, elements of metabolism; 6.3. Simple lipids: triacylglycerols, waxes, estolides, sterides; 6.4. Complex lipids: phospholipids, glycolipids, sphingolipids, cerebrosides, gangliosides, terpenes, lipoproteins.	2	

[11] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[12] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

Bibliography [13]

1. C.D. Neniţescu, Organic Chemistry, vol I and II, Didactic and Pedagogical Publishing House, Bucharest, 8th edition, 1982;
2. Margareta Avram, Organic Chemistry, vol I and II, Zecasin Publishing House, Bucharest, second edition, 1994;
3. A.L. Lehninger, Biochemistry, vol I, Technical Publishing House, Bucharest, 1987;
4. D. Voet, J. G. Voet, C.W. Pratt, Fundamentals of Biochemistry; John Wiley and Sons 1990;
5. A. Lupea, Complements of Biochemistry, "Politehnica" University of Timişoara, 1997;
6. A.X. Lupea, Fundamentals of Biochemistry; Academy Publishing House, Bucharest, 2007.

8.2 Applied activities [14]	Number of hours	Teaching methods
1. Carbohydrates (sugars). Monosaccharides - aldoses and ketoses from the D configuration series; Fischer and Howarth structures; α/β anomery, epimers; Oligo- and polysaccharides; mono- and dicarbonyl bonds in oligosaccharides and polysaccharides, enzymatic hydrolysis, examples of enzymes, determination of the structure of some oligosaccharides based on chemical analyzes (degradations, specific reactions of aldoses / ketoses) and biochemical (enzymatic hydrolysis).	5	Interactive oral presentation accompanied by exercises and problems on course theme, methods and techniques of learning through cooperation, debate, discussions, brainstorming.
2. Nucleotides, nucleic acids: the structure of a polynucleotide; RNA types and characteristics; decoding a peptide sequence encoded by a single stranded DNA sequence.	2	
3. Amino acids, peptides and proteins: Natural amino acids, acid-base behavior of amino acids, buffers, calculation of isoelectric pH of amino acids and oligopeptides, net electric charge, peptide electrophoresis, peptide synthesis: protection of amino and carboxyl groups, couplings and their additives.	5	
4. Lipids and membranes: the structure of simple and complex lipids, cardiolipins, plasmalogens, physical properties of saturated and unsaturated fatty acids (mono- and polyenoic) from triacylglycerols and other complex lipids.	2	

Bibliography [15]

1. D.L. Nelson, M.M. Cox, Lehninger - Principles of Biochemistry, 7th ed., W. H. Freeman and Company, 2017;
2. A.X. Lupea, Biochemistry (Applications), Politehnica Publishing House, Timişoara, 2003;
3. A. Lupea, Complements of Biochemistry, "Politehnica" University of Timişoara, 1997;
4. A.X. Lupea, M. Pădure, Biochemistry and the bases of assimilation. Practical works, Technical University of Timişoara, 1995.

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- When compiling the content of the discipline, the requirements of the representative employers in chemical industry were taken into account, which also involve general notions of biochemistry.

10. Evaluation

[13] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[14] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[15] At least one title must belong to the discipline team.

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	The assimilating of the knowledge and solving the problems	Two tests written during the semester; The evidence of attendance.	0.66
10.5 Applied activities	**S:** The understanding way of the notions and concepts taught during the course and translating them into applicative and theoretical problems.	Discussions, applications and proposed problems, noting the way of solving the received problems as individual study topics; The evidence of attendance.	0.34
	L:		
	P[17]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [18])			
• Solving at least 50% of the subjects in the evaluation tests and at least grade 5 (out of maximum 10) at the ongoing activity.			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
	……	……
Head of Department (signature)	**Date of approval in the Faculty Council** [19]	**Dean (signature)**
……		……

[16] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

[17] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

[18] It will not explain how the promotion mark is awarded.

[19] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.