

SYLLABUS

1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty ¹ / Department ²	Chemical Engineering, Biotechnologies and Environmental Protection / CAICON
1.3 Field of study (name/code ³)	Chemical Engineering / 10.30.50
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	Chemical Engineering / 10.30.50.60 / engineer

2. Information about the discipline

2.1 Name of discipline/ formative category ⁴	Organic chemical technology and biotechnologies / DS						
2.2 Coordinator (holder) of course activities	S.L.dr.ing. Sabina NIȚU / S.L.dr.ing. Cristina PAUL						
2.3 Coordinator (holder) of applied activities ⁵	S.L.dr.ing. Sabina NIȚU / S.L.dr.ing. Cristina PAUL						
2.4 Year of study ⁶	IV	2.5 Semester	7	2.6 Type of evaluation	E	2.7 Regime of discipline ⁷	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted)⁸

3.1 Number of fully assisted hours / week	6 of which:	3.2 course	3	3.3 seminar / laboratory / project	0/3/0
3.1* Total number of fully assisted hours / semester	84 of which:	3.2* course	42	3.3* seminar / laboratory / project	0/42/0
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	4.71 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.7
		hours of individual study after manual, course support, bibliography and notes			1
		training seminars / laboratories, homework and papers, portfolios and essays			2
3.7* Number of hours of unassisted activities / semester	66 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			10
		hours of individual study after manual, course support, bibliography and notes			30
		training seminars / laboratories, homework and papers, portfolios and essays			26
3.8 Total hours / week ⁹	10.71				
3.8* Total hours /semester	150				
3.9 Number of credits	6				

4. Prerequisites (where applicable)

4.1 Curriculum	•
4.2 Competencies	•

¹ The name of the faculty which manages the educational curriculum to which the discipline belongs

² The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

³ The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.

⁴ 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).

⁵ Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

⁶ Year of studies in which the discipline is provided in the curriculum.

⁷ Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).

⁸ 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.

⁹ The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> • Classroom equipped with blackboard, projector and computer • Students will not attend lectures with mobile phones on • Loitering will not be tolerated, as it is disruptive to the educational process.
5.2 to conduct practical activities	<ul style="list-style-type: none"> • Functional UV-VIS Spectrophotometer • Functional Gas Chromatograph • Students will participate in the laboratory work in lab coats and will document the current session's laboratory work.

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • Performing calculations, demonstrations and applications to solve specific Chemical Engineering tasks, based on fundamental science knowledge. • Production, processing and characterization of materials. • Knowing the main industrial chemical processes, their raw materials and products and the technological problems for each case. • Understanding the main phenomena involved in biotechnological processes.
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • - Analyse production processes for improvement; • - Manage chemical testing procedures; • - Test materials; • - Write technical reports • -Performs chemical experiments • -Approve engineering design • -Assess environmental impact

Transversal competencies ascribed to the specific competencies

- - Conduct quality control;
- - Apply scientific, technological and engineering knowledge;
- - Uses equipment, instruments or technological equipment accurately.

•

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

7.1 The general objective of the discipline	<ul style="list-style-type: none"> • The general objective of the discipline is the knowledge of the main chemical and technological aspects of the processing of organic and biochemical compounds.
7.2 Specific objectives	<ul style="list-style-type: none"> • Knowledge and mastery of chemical technological processing methods organized according to the nature of the main reaction, chemistry, thermodynamics, mechanism and kinetics and technological implications as well as the known possibilities of industrial execution with specific technological problems; Knowledge and mastery of the main biotechnological processes.

8. Content ¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
Basic raw materials in the chemical industry - crude oil, coal, natural gas, vegetable oils, sugars Raw materials, derived from basic raw materials, used in organic chemical technologies	2	Interactive teaching with video support

¹⁰ 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 "(*)".

¹¹ Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

Catalytic systems – used in organic chemical technologies -homogeneous, heterogeneous catalytic systems with fixed catalyst layer, fluidized layer, catalysis with interphase transfer, acid-base, etc. -deactivation and regeneration of catalyst	1	
Oxidation - general aspects (types of reactions, thermodynamic aspects, types of mechanisms, oxidizing agents, catalysts, industrial execution, special problems in the oxidation performane); oxidation of aliphatic hydrocarbons, oxidation of olefins, oxidation of aromatic hydrocarbons; Hydrogenation – types of reactions, thermodynamic and kinetic aspects, catalytic systems, industrial implementation, types of reactors. Hydrogenation of vegetable oils. Reactions with carbon monoxide. Oxidative carbonylation. Reductive carbonylation. Hydroformylation of olefins	2 2 1 2 2	
Methanol synthesis	2	
Sulfonation (thermodynamic and kinetic aspects, sulfonating agents, types of chemical sulfonation reactors)	2	
Nitration (thermodynamic aspects and technological problems, types of reactors)	2	
Esterification – thermodynamic aspects, ways of moving the chemical balance Surface active agents – structure characteristics, behavior, uses, synthesis of raw materials (fatty alcohols, fatty acids) and methods of obtaining	1 2	
Introduction to biotechnology	3	
Types and growth of microorganisms	3	
Culture media: composition, characteristics, preparation	3	
Fermentation: principles, parameters, bioreactors	3	
Biotechnologies for obtaining inferior alcohols	3	
Biotechnologies for the production of amino acids and organic acids Biotechnologies for the production of antibiotics	3 3	
Bibliography ¹² 1.R.J.Farrauto și C.H. Bartholow, <i>Fundamentals of Industrial Catalytic Processes</i> , Blackie A&P, Londra, 2000 2. H.A.Wittcoff, <i>Industrial Organic Chemicals</i> , J.Wiley&Sons, Chichester, 1996 3. S. Nițu, <i>Organic Chemical Technology and Biotechnologies (part of organic chemical technology)</i> , Politehnica University of Timișoara, course support, 2023 4. C. Dăescu, <i>Bio- and semisynthesis products</i> , Editura Politehnica, Timișoara, 2006 5. F. Peter, <i>Biotransformări enzimaticice</i> , Editura Politehnica, Timișoara, 2005 6.C. Paul, <i>Organic Chemical Technology and Biotechnologies (part of biotechnologies)</i> , Politehnica University of Timișoara, course support, 2023		
8.2 Applied activities ¹³	Number of hours	Teaching methods
Laboratory-specific labor protection and PSI training. Presentation of practical works	2	Presentation and explanation of the principle and method of carrying out the works, as well as the interpretation of the results and the calculation of work yields.
Defining the raw materials and products of the organic industry (density, distillation curve, flash points, surface tension; refractive index, viscosity, notions of instrumental analysis of organic products)	4	
Carrying out a chemical reaction using ion exchange resin catalysts Shifting the chemical equilibrium of a chemical reaction by using water-entraining agents	4 4	

¹² 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.

¹³ 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".

Synthesis of a sulfosuccinate with a long alkyl chain: analysis of raw materials, tracking the reaction yield by the acidity index of the reagent mixture; defining the reaction product	4	
Synthesis of biodiesel: characterization and calculation of raw material requirements, reaction yield calculation and physico-chemical analysis of the product	4	
Characterization of amylolytic enzymes used for starch hydrolysis: activity determination, protein content determination	8	
Determination of ethyl alcohol in distilled alcoholic beverages	4	
Biosynthesis of an ester by enzymatic catalysis	4	
Obtaining optically active compounds by enzymatic biocatalysis	4	
Bibliography ¹⁴		
1. Sabina-Violeta Nițu, "Procese tehnologice chimice - calcule și lucrări practice", Editura POLITEHNICA, Timișoara, 2016, ISBN: 978-606-350-081-7 .		
2. Ana Cristina Paul, <i>Biotehnologii în industria alimentară. Lucrări Practice</i> . Editura Politehnica, 2018		
3. G. Preda, F. Peter, M. Dragomirescu, <i>Biocatalizatori enzimatici. Obținere, caracterizare, aplicații</i> . Editura Mirton, Timișoara, 2003.		
4. S. Nielsen (Editor), <i>Food Analysis Laboratory Manual</i> , 3rd Edition, Springer, Heidelberg, 2017		

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

<ul style="list-style-type: none"> The content of the subject was developed in consultation with decision-makers in the business sector.

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Acquiring the main principles and technological aspects of chemical and biotechnological industrial processes.	Knowledge verification is done through a written exam (3 hours) based on knowledge verification topics and comparative process analysis and/or grid.	0.66
10.5 Applied activities	S: Submission of reports with results and conclusions for the works performed. Obtaining experimental results comparable to standard ones.	Partial examination. Discussions of the teaching staff with the students and the correction of the work reports	0.34
	L:		
	P¹⁶:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified ¹⁷)			
<ul style="list-style-type: none"> 60% of the subjects must be solved correctly. At least grade 5 in each written evaluation must be obtained to pass the subject. Teaching the results of practical laboratory work, thus demonstrating the mastery of the knowledge of the work. 			

Date of completion

**Course coordinator
(signature)**

Ș.L.dr.ing. Sabina-Violeta NIȚU /
Ș.L.dr.ing. Ana Cristina PAUL

**Coordinator of applied activities
(signature)**

Ș.L.dr.ing. Sabina-Violeta NIȚU /
Ș.L.dr.ing. Ana Cristina PAUL

¹⁴ At least one title must belong to the discipline team.

¹⁵ 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.)

¹⁶ 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.

¹⁷ It will not explain how the promotion mark is awarded.

**Head of Department
(signature)**

S.L.dr.ing. Andra TĂMAȘ

Date of approval in the Faculty Council ¹⁸

**Dean
(signature)**

Ș.L.dr.ing. Mircea DAN

¹⁸ The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.