

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	Applied biotechnology / DS						
2.2 Coordinator (holder) of course activities	Conf.dr.ing. Anamaria TODEA						
2.3 Coordinator (holder) of applied activities ⁵	As. Drd. Ing. Ioana Critina BENEA						
2.4 Year of study ⁶	IV	2.5 Semester	8	2.6 Type of evaluation	E	2.7 Regime of discipline ⁷	DO

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	4 of which:	3.2 course	2	3.3 seminar / laboratory / project	0/2/0
3.1* Total number of fully assisted hours / semester	56 of which:	3.2* course	28	3.3* seminar / laboratory / project	0/28/0
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	6.71 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			
		hours of individual study after manual, course support, bibliography and notes			
		training seminars / laboratories, homework and papers, portfolios and essays			
3.7* Number of hours of unassisted activities / semester	94 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			
		hours of individual study after manual, course support, bibliography and notes			
		training seminars / laboratories, homework and papers, portfolios and essays			
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	<ul style="list-style-type: none"> Biochemistry, Organic Chemistry
4.2 Competencies	<ul style="list-style-type: none"> Ability to work in a team; Knowledge of general laboratory practices

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"> Lecture room, equipped with: blackboard, video projector and computer Students will come to class with their mobile phones turned off Student participation in the course according to the regulations in the APPENDIX TO H.S. NO. 233 of 15.09.2016, APPENDIX no. 4 of the UPT Charter in force
5.2 to conduct practical activities	<ul style="list-style-type: none"> Spaces and facilities: Specialized laboratory for biotechnologies, Student obligations: Compliance with labor protection rules and instructions in the laboratory Use of personal protective equipment The correct use of equipment, utensils and materials from the laboratory equipment Elaboration and support of a project on a topic assigned at the first laboratory session. The performance of practical laboratory work by students is conditioned by the acquisition of minimum knowledge presented in the laboratory report. In this sense, students will take laboratory tests before each practical work and the minimum grade for the practical performance of the work must be 5.00. Otherwise, the student acknowledges that he cannot participate in the practical work, which will be recovered in separate sessions according to the regulation in the APPENDIX TO H.S. NO. 233 of 15.09.2016, APPENDIX no. 4 of the UPT Charter in force

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> Acquisition of specific terminology for the biotechnologies field Description, analysis and use of fundamental concepts and theories in the field of food biotechnologies Exploitation of biotechnological processes and facilities, with the application of engineering knowledge Understanding, describing and using the main biochemical mechanisms involved in food biotechnological processes Exploitation of equipment and the use of analysis and characterization methods specific to food products
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	<ul style="list-style-type: none"> - Conduct quality control; - Apply scientific, technological and engineering knowledge; <ul style="list-style-type: none"> - 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"> Training and development of the basic skills needed to understand the processes and operate the facilities that make biotechnologies
7.2 Specific objectives	<ul style="list-style-type: none"> Developing the necessary skills for choosing the microorganism and the culture conditions in the case of a given process. Identifying the essential elements of biotechnologies, with an emphasis on those that allow obtaining food products; Monitoring the specific stages of biosynthesis technologies, identifying critical points and

	solving problems under conditions of qualified assistance; • • Analysis and interpretation of biotechnological fundamentals and identification of correlations with other disciplines
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8. Content ¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
1. General notions about biotechnologies Introduction, history, types of processes, the main stages	4	Lecture, use of video projector, resources in electronic format
2. Microorganismele utilizate în biotehnologii Tipuri de microorganismele Selectarea și ameliorarea microorganismelor Organismele modificate genetic	6	
3. Culture media and their characteristics Establishing the composition of the culture medium Sterilization of culture media and equipment used	2	
4. The fermentation process Definitions. Equipment used Phases of development of microorganisms Laboratory cultures, inoculum cultures and production cultures The factors that influence the development of fermentation processes industrially	4	
5. Separation and purification of fermentation products Biomass separation; Isolation of the product; Purification of the product	4	
6. Fermentation ethyl alcohol production technology Raw materials for ethanol production. Alcoholic fermentation. Obtaining ethanol from fermentation media	4	
7. Organic acids obtained through biotechnologies	2	
8. Optically active compounds synthesized by biotechnological means	2	
Bibliography ¹² 1. Dăescu, C., Produse de bio- și semisinteză, Editura Poliitehnica, Timișoara, 2006 2. P.F. Stanbury, A. Whitaker, Principles of fermentation technology, 3rd Edition, Elsevier, Amsterdam, 2016. 3. M. Moo-Young (Editor-in-Chief), Comprehensive Biotechnology, Volume 3: Industrial biotechnology and commodity products, Elsevier, Amsterdam, 2011. 4. Banu C. și colectiv, Biotehnologii în Industria Alimentară, Ed. Tehnică, București, 1987 5. Soccol C.R., Brar S.K., Faulds C., Ramos L.P. (Editors), Green Fuels Technology. Biofuels, Springer, Heidelberg, 2016.		
8.2 Applied activities ¹³	Number of hours	Teaching methods
1. Norms of safety technique and labor protection in the biotechnology laboratory. Presentation of the equipment and the main working techniques in the biotechnological laboratory	4	education
2. Determination of proteins by the Bradford method. Biotechnological applications	4	Individual work
3. Measurement of α -amylase activity from malt and from a commercial enzyme preparation	4	Individual work
4. Dosing of amylogucosidase activity from a commercial enzyme preparation	4	Individual work
6. Alcoholic fermentation using yeasts - Part	4	Individual work
7. Alcoholic fermentation using yeasts - Part II	4	Individual work

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.).

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".

Bibliography ¹⁴ . A.C. Paul, Biotehnologii în industria alimentară. Lucrări Practice. Editura Politehnica, 2018.		
2. G. Preda, F. Peter, M. Dragomirescu, Biocatalizatori enzimatici: obținere, caracterizare, aplicații, Editura Mirton Timișoara, 2003		

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

- The discipline contributes to the development of the necessary skills to understand and exploit biotechnological processes, being consistent with the requirements of employers in the respective field. The process studied in detail, the alcoholic fermentation technology, is the fermentation process that is the basis of many technologies but at the same time offers the possibility to work in other fields that use this product, such as biofuels

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Evaluation of knowledge interest	Assessment: oral exam, including two theoretical subjects and one subject with an applied nature	60%
10.5 Applied activities	S:		
	L: Assessment of practical knowledge	Written assessment at each laboratory session	40%
	P ¹⁶ :		
	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"> studying course notes; participation in practical laboratory work promotion of the subject is conditional on solving 50% of the subjects in the exam and a minimum average of 5 in the Assessment of practical knowledge 			

Date of completion

**Course coordinator
(signature)**

Conf.dr.ing Anamaria Todea

**Coordinator of applied activities
(signature)**

Asist. Drd Ioana Cristina BENEĂ

**Head of Department
(signature)**

S.L.dr.ing. Andra TĂMAȘ

Date of approval in the Faculty Council¹⁸

**Dean
(signature)**

Ș.L.dr.ing. Mircea Laurențiu DAN

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.

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