

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	Synthetic drugs / DS						
2.2 Coordinator (holder) of course activities	Prof.dr.ing. Daniel HĂDĂRUGĂ						
2.3 Coordinator (holder) of applied activities ⁵	Ș.L.dr.ing. Valentin ORDODI						
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			2.14
		hours of individual study after manual, course support, bibliography and notes			2.5
		training seminars / laboratories, homework and papers, portfolios and essays			2.07
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			30
		hours of individual study after manual, course support, bibliography and notes			35
		training seminars / laboratories, homework and papers, portfolios and essays			29
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"> Organic chemistry Instrumental analytical chemistry
----------------	--

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.

	<ul style="list-style-type: none"> • Spectroscopic and chromatographic methods / Analysis and control • Intermediaries in the organic industry • Chemistry of natural compounds
4.2 Competencies	<ul style="list-style-type: none"> • -

5. Conditions (where applicable)

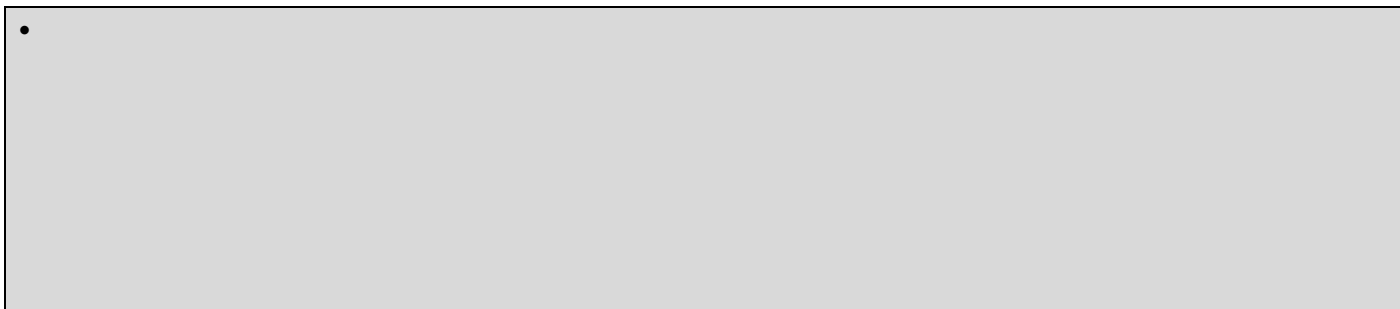
5.1 of the course	<ul style="list-style-type: none"> • Students' participation in classes and lectures will be carried out according to the UPT regulations in force, respectively the UPT Charter. The course takes place at the location: Timisoara, Carol Telbisz 6, Room 302 / 303 / ACD or online, depending on sanitary conditions. Students' lateness to class without a well-founded reason will not be tolerated, as this proves disruptive to the educational process.
5.2 to conduct practical activities	<ul style="list-style-type: none"> • The students' participation in the practical works, as well as their recoveries, will be carried out according to the regulations in force in the UPT, respectively the UPT Charter, with (1) compliance with the labor protection rules and instructions in the laboratory, (2) the use of individual protective equipment, (3) the development and support of a project on a topic given at the first laboratory session, (4) 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 the 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 regulations in force in the UPT, respectively the UPT Charter. The practical activities take place in the location: Timișoara, Carol Telbisz 6, specific laboratories or online for works that lend themselves to such a modality, depending on sanitary conditions. The deadline for handing in the report related to the laboratory work is established by the holder in agreement with the students. Requests for its postponement will not be accepted for other than objectively well-founded reasons.

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • Description, analysis and use of basic concepts and theories in the engineering of natural and synthetic drugs; Description, analysis and use of basic concepts and theories in chemistry and chemical engineering in the field of natural and synthetic drugs; Exploitation of processes and installations with the application of knowledge in the field of natural and synthetic medicine engineering; Description, analysis and use of concepts regarding the structure, reactivity and interactions of natural and synthetic drugs; Exploitation of equipment and methods of analysis and characterization specific to natural and synthetic drugs. • The specific competences ensured by the study program of which the discipline is a part are knowledge, understanding of concepts, theories and methods in the area of natural and synthetic drugs, respectively use in professional communication in terms of fundamental and practical-applicative aspects the tactics and strategy of drug synthesis, the chemistry, semi-synthesis and synthesis of these drugs, the methods of separation, purification and analysis for application purposes and the identification of possible structural changes in order to improve the physico-chemical properties and biological activities. The graduate will have the ability to apply the basic principles and methods for solving problems/situations in the field of natural and synthetic drugs, to use the standard evaluation criteria and methods appropriately, to appreciate the quality, merits and limits of some processes, programs, projects, concepts, methods and theories, respectively for the development of professional projects with the use of established principles and methods in the field.
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 <ul style="list-style-type: none"> • -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 objective of the discipline is to make contributions from the field of natural and synthetic drugs, to the knowledge and understanding of the basic concepts, theories and methods of chemical engineering, especially with regard to the chemistry and engineering of organic substances (including the field of petrochemicals and carbochemistry), and their appropriate use in professional communication, respectively in the use of basic knowledge to explain and interpret various types of concepts, situations, processes, projects, etc. associated with the field.
7.2 Specific objectives	<ul style="list-style-type: none"> The specific objectives ensured by the study program of which the discipline is a part are knowledge, understanding of the concepts, theories and methods in the field of natural and synthetic drugs, respectively use in professional communication regarding the fundamental and practical-applicative aspects of designing and obtaining drugs, methods of separation, purification and analysis of these compounds for application purposes. The graduate will have the ability to apply the basic principles and methods for solving problems/situations in the field of compounds with medicinal/pharmaceutical activity, to use the appropriate criteria and standard evaluation methods, to appreciate the quality, value and limits of some processes, programs, projects, concepts, methods and theories, respectively for the development of professional projects with the use of established principles and methods in the field.

8. Content¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
1. Introduction to the issue of drugs: Nomenclature and classification of drugs; Drug design/discovery	4	Lecture, including the use of modern presentation methods (video projection, electronic resources, online presentation - Zoom, etc.). Interactive approaches to some exemplary aspects.
2. Central nervous system drugs: Narcotics. Sedatives; Anticonvulsants; Psychopharmacological agents; Analgesics, antithermic, anti-inflammatory drugs; Antitussives; Local anesthetics; Adrenergic drugs; Adrenolytics; Cholinergic drugs; Spasmolytics; Muscle relaxants; Antihistamines	6	
3. Cardiovascular drugs: Cardiotonics; Antiarrhythmics; Coronarodilators; Antihypertensives; Coagulants - anticoagulants; Venotonics.	6	
4. Diagnostic and diuretic substances	2	
5. Chemotherapeutic drugs: Sulfamides; Antimycotics; Tuberculostatic; Anthelmintics; Antivirals; Cytostatics; Antiseptics.	6	
6. Vitamins and hormones	4	

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.).

- Bibliography ¹² 1. Hadaruga, D.I., Medicamente naturale și de sinteză, Electronic Release, 2023, <http://www.chim.upt.ro>; <https://cv.upt.ro/login/index.php>
2. Daescu, C., Chimia si tehnologia medicamentelor, Ed. Politehnica, Timisoara, 2008.
3. Daescu, C., Industria medicamentului, Editura Politehnica, Timisoara, 2007.
4. Hădărugă, D.I., *Cyclodextrine. Fundamente, aplicații farmaceutice și alimentare (I)*, Editura Eurostampa, Timișoara, 2014, ISBN 978-606-569-945-8.
5. Olah, M.; Rad, R.; Ostopovici, L.; Bora, A.; Hădărugă, N.G.; Hădărugă, D.; Moldovan, R.; Fulias, A.; Mracec, M.; Oprea, T.I., Chemical informatics: WOMBAT and WOMBAT-PK: Bioactivity databases for lead and drug discovery; In: *Chemical Biology: From Small Molecules to Systems Biology and Drug Design*, Wiley-VCH, New York, 2008, Vol. 2(21), April 2008, pp. 760-786, ISBN-10: 352-731-150-5, ISBN-13: 978-352-731-150-7, URL: <http://onlinelibrary.wiley.com/book/10.1002/9783527619375>, doi: <https://doi.org/10.1002/9783527619375.ch13b>
6. Hădărugă, N.G.; Bandur, G.N.; Hădărugă, D.I.*. Thermal analyses of cyclodextrin complexes. In: *Cyclodextrin Fundamentals, Reactivity and Analysis*, Fourmentin, S.; Crini, G.; Lichtfouse, E. (Eds.), in series: "Environmental Chemistry for a Sustainable World", vol. 16, Springer International Publishing AG (part of Springer Nature), Cham, 2018, ISBN (print): 978-3-319-76158-9, eISBN: 978-3-319-76159-6, series ISSN: 2213-7114, pp. 155-221, doi: https://doi.org/10.1007/978-3-319-76159-6_4
7. Margolis, S.A.; Huang, P.H.; Hădărugă, N.G.; **Hădărugă, D.I.***, Water determination. In: Worsfold, P.; Poole, C.; Townshend, A.; Miro, M. (Eds.), *Encyclopedia of Analytical Science. Chemistry, Molecular Sciences and Chemical Engineering Reference Module*, 3rd ed., Elsevier Ltd, Oxford, 2019, pp. 382-390, ISBN 978-0-12-409547-2.14505-6, <https://doi.org/10.1016/B978-0-12-409547-2.14505-6>
8. Dănilă, G., Medicamente moderne de sinteză, București ALL, 1994
9. Oniscu, C., Chimia și tehnologia medicamentelor, Ed. Tehnică, București, 1988
10. Silverman, R.B., The organic chemistry of drug design and drug action, Elsevier, Amsterdam, 2004
11. van de Waterbeemd, H., Structure-property correlations in drug research, Austin Academic Press, 1996.
12. Ahuja, S., Chiral separation methods for pharmaceutical and biotechnological products, Wiley, Hoboken, 2011.

8.2 Applied activities ¹³	Number of hours	Teaching methods
1. Sinteză chimică și electrochimică a iodoformului. Aspecte NTS-PSI.	6	Presentation of the application problem, discussions regarding the application activity (experimental work) and NTS-PSI. Carrying out the actual work. Calculation, discussions and conclusions.
2. Sinteză și analiza sulfacetamidei. Izolarea, hidroliza și dozarea streptomisinei din „Asocilin”	6	
3. Sinteză și identificarea paracetamolului	4	
4. Sinteză benzocainei	4	
5. Relații calitative structură chimică – activitate biologică. Aplicarea metodelor de chimie combinatorială în descoperirea medicamentelor.	4	
6. Modelare moleculară și relații cantitative structură chimică – activitate biologică (QSAR)	4	

- Bibliography ¹⁴ 1. Ordodi, V.; Hadaruga, D.I., Medicamente naturale și de sinteză, Lucrari experimentale, Electronic Release, 2023, <https://cv.upt.ro/login/index.php>
2. Daescu, C., Chimia si tehnologia medicamentelor, Ed. Politehnica, Timisoara, 2008.
3. Daescu, C., Industria medicamentului, Editura Politehnica, Timisoara, 2007.
4. Olah, M.; Rad, R.; Ostopovici, L.; Bora, A.; Hădărugă, N.G.; Hădărugă, D.; Moldovan, R.; Fulias, A.; Mracec, M.; Oprea, T.I., Chemical informatics: WOMBAT and WOMBAT-PK: Bioactivity databases for lead and drug discovery; In: *Chemical Biology: From Small Molecules to Systems Biology and Drug Design*, Wiley-VCH, New York, 2008, Vol. 2(21), April 2008, pp. 760-786, ISBN-10: 352-731-150-5, ISBN-13: 978-352-731-150-7, URL: <http://onlinelibrary.wiley.com/book/10.1002/9783527619375>, doi: <https://doi.org/10.1002/9783527619375.ch13b>
5. Dănilă, G., Medicamente moderne de sinteză, București ALL, 1994
6. van de Waterbeemd, H., Structure-property correlations in drug research, Austin Academic Press, 1996
7. Li, J.J.; Limberakis, C.; Pflum, D.A., Modern Organic Synthesis in the Laboratory A Collection of Standard Experimental Procedures, Oxford University Press, Oxford, 2007
8. Sittig, M., Pharmaceutical Manufacturing Encyclopedia, Noyes Publ., Westwood, NJ, 1988.
9. *** Pharmaceutical Manufacturing Encyclopedia, 3rd ed., William Andrew Publ., Norwich, NY, 2007.

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

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".

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

- The content of the discipline is in accordance with the level of expectations and current research in the field of natural and synthetic drugs, both of the international scientific community (studies in the field of design and analysis of drugs and bioactive compounds, in which students are involved, are presented at conferences or are published in specific journals, some with international visibility), as well as professional associations and representative employers (joint meetings were organized through the Polytechnic University of Timișoara Steering Committee, which includes important representatives of the business environment in Romania and Europe; collaborators and employers in the field have a special interest in students/graduates who have the skills given by this discipline).

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	The final verification of knowledge is done through a written exam (exam lasting three hours, with a minimum number of ten questions/subjects covering the theoretical/applicative parts in a ratio of 1/1, through which the competences and skills acquired are checked), after which the exam grade is obtained.	Passing the exam in the discipline requires solving at least half of each set of subjects: theoretical and applied. According to the regulation for the organization and development of the initial education process from the Polytechnic University of Timișoara, the final mark is established with the formula: Final grade = Integer $[k_1 \cdot e + k_2 \cdot p + 0.5]$ where: e – exam grade; p – grade for the practical activity; k ₁ , k ₂ – weighting coefficients with the properties: $k_1 + k_2 = 1$ and $k_2 \geq (k_1)/2$ For the discipline of "Natural and synthetic drugs" the coefficients k ₁ and k ₂ are: k ₁ = 0.66, k ₂ = 0.34	66%
10.5 Applied activities	S:		
	L: During the hours of laboratory work, the way to acquire laboratory practice, the methods of rational design, synthesis and analysis of some drugs is evaluated through discussions and tests.	Passing the exam in the discipline requires solving at least half of each set of applied subjects. The grades obtained in the tests, those obtained following the discussions of the reports drawn up from the laboratory works and the activity in the course, constitute the basis for the grade for the practical activity.	34%
	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"> The promotion of the distributed assessment in the discipline requires solving at least half of each set of subjects: theoretical and applied. 			

Date of completion

Course coordinator
(signature)

Coordinator of applied activities
(signature)

Prof.dr.eng. Daniel HĂDĂRUGĂ

Ș.L.dr. eng. Valentin ORDODI

Head of Department
(signature)

Date of approval in the Faculty Council ¹⁸

Dean
(signature)

S.L. dr. eng. Andra TĂMAȘ

Ș.L.dr.ing. Mircea Laurențiu DAN

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.