

SYLLABUS

1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty ¹ / Department ²	Industrial Chemistry and Environmental Engineering / 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	Analysis and Control / DS						
2.2 Coordinator (holder) of course activities	S.L.dr.ing. Valentin BADEA/ S.L.dr.ing. Valentin ORDODI						
2.3 Coordinator (holder) of applied activities ⁵	S.L.dr.ing. Valentin BADEA/ S.L.dr.ing. Valentin ORDODI						
2.4 Year of study ⁶	III	2.5 Semester	5	2.6 Type of evaluation	D	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	3.14 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			1,14
		training seminars / laboratories, homework and papers, portfolios and essays			1
3.7* Number of hours of unassisted activities / semester	44 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			12
		hours of individual study after manual, course support, bibliography and notes			18
		training seminars / laboratories, homework and papers, portfolios and essays			14
3.8 Total hours / week ⁹	7.14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> Organic chemistry, physical chemistry, structure and properties of molecules
4.2 Competencies	<ul style="list-style-type: none"> Proficiency in handling laboratory utensils and equipment

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 and video projector • Students attending the class will have their cell phones on airplane mode or switched 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
5.2 to conduct practical activities	<ul style="list-style-type: none"> • Spaces and facilities: • UV-VIZ spectroscopy laboratory, IR spectroscopy laboratory, Mass spectrometry laboratory, NMR spectroscopy laboratory, Gas chromatography laboratory • Student obligations: • Compliance with labor protection rules and instructions in the laboratory • Mandatory use of personal protective equipment • Correct and careful use of the equipment, utensils and materials in the laboratory • The performance of practical laboratory work by students is conditioned by the acquisition of some minimum knowledge presented in the laboratory report. Verification of this knowledge will be done by taking tests before each practical laboratory work. The minimum test grade for the practical performance of the laboratory work is 5.00. Otherwise, the student will be informed 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.

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • The use of equipment and methods of analysis and characterization specific to organic chemical products: preparation of samples for spectroscopic and chromatographic analyses, basic spectroscopic techniques and the interpretation of spectra, TLC and electrophoretic methods, gas chromatographic techniques and the determination of the main chromatographic parameters
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • - Analyzes production processes for improvement • - Manages chemical analysis procedures • - Tests materials • - Writes technical reports • - Performs chemical experiments • - Approves engineering projects • - Manages the environmental impact of operations
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • - Conducts quality control; • - Applies scientific, technological and engineering knowledge; • - Uses equipment, instruments or technological equipment with precision.

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 acquire the basic notions related to the analysis and control methods used in chemistry laboratories with an organic profile.
7.2 Specific objectives	<ul style="list-style-type: none"> • Two directions will be followed: the study of spectroscopic methods of analysis and determination of the structure of chemical compounds as well as the control of chemical processes by chromatographic methods.

8. Content ¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
Introductory elements of electronic spectroscopy. UV-VIZ spectrophotometry as a method of analysis and control (theoretical presentation and applications)	2	Interactive teaching, lecture, demonstration, problem solving, case study, cooperative learning methods and techniques; Exposure with a video projector for fixing and consolidating knowledge. Course materials will be printed or sent by e-mail, resource page in electronic format.
Infrared spectroscopy as a method of analysis and control (theoretical presentation and applications).	3	
Nuclear magnetic resonance spectroscopy as a method of analysis and control (theoretical presentation and applications).	5	
Mass spectrometry as a method of analysis and control (theoretical presentation and applications).	2,5	
Integrated methods of analysis and control of products and chemical reactions	1,5	
Principles of chromatographic analysis methods	2	
Analysis and control by gas chromatography on capillary columns and packed columns	10	
Applications of chromatographic analysis in the industrial environment. Industrial process chromatography.	2	
Bibliography ¹² 1. V. Badea, M. Medeleanu, <i>Metode spectroscopice utilizate în analiza compușilor organici</i> , Universitatea Politehnica Timișoara, Note de curs 2. R. Bacaloglu, C. Csunderlik, L. Cotarcă, H.H. Glatt, <i>Structura și proprietățile compușilor organici</i> , Editura Tehnică, București 1985, vol I 3. R.M. Silverstein, F.X. Webster, D. J. Kiemle <i>Spectrometric identification of organic compounds</i> , John Wiley & Sons, Inc., New York, 8th ed., 2055 4. A.T. Balaban, M. Banciu, I.I. Pogany <i>Aplicații ale metodelor fizice în chimia organică</i> , Ed. Științifică și Enciclopedică, București, 1983 5. C. Liteanu, S. Gocan., A. Bold <i>Separatologie analitică</i> , Ed. Dacia, Cluj-Napoca, 1981 6. R. L. Grob, E. F. Barry <i>Modern practice of gas chromatography</i> , John Wiley & Sons, Inc., Hoboken, New Jersey, 4th ed., 2004 7. F. G. Kitson, B. S. Larsen, Ch. M. McEwen <i>Gas chromatography and mass spectrometry</i> , Academic Press, 1996 8. Poole F.C, <i>Gas Chromatography</i> , Elsevier, 2012. 9. Ciucanu, I., <i>Metode Fizico-Chimice in Analiza Chimica Instrumentala</i> , Editura Mirton, Timisoara, 1996		
8.2 Applied activities ¹³	Number of hours	Teaching methods
1. The rules for conducting the laboratory activity. Introduction to experimental laboratory analysis techniques.	2	Education
2. Analysis by UV-Vis spectrophotometry: experimental determinations and spectral applications	2	Practical activity in the laboratory, Experimental data processing and their interpretation
3. Analysis by infrared spectroscopy: experimental determinations and spectral applications	3	
4. Analysis by nuclear magnetic resonance spectroscopy: experimental determinations and spectral applications	3	Work individually or in teams of 3-4 people
5. Analysis by mass spectrometry: experimental determinations and spectral applications 6. Analysis by combined spectrophotometric and spectroscopic methods	4	Work individually or in teams of 3-4 people
7. Thin layer and paper chromatography of a mixture of amino acids	2	Work individually or in teams of 3-4 people
8. Separation by agarose gel electrophoresis of some food dyes	2	Work individually or in teams of 3-4 people

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".

9. Chromatographic retention parameters, Performance of chromatographic columns, Qualitative and quantitative gas chromatographic analysis	8	Work individually or in teams of 3-4 people
10. Complex analytical control through integrated experimental determinations. Gas chromatographic method coupled with mass spectrometry	2	Work individually or in teams of 3-4 people
Bibliography ¹⁴ 1. Laboratory reports available in electronic and printed format 2. M. Medeleanu, M. Milea, <i>Metode spectroscopice în chimia organică – Îndrumător de laborator</i> , Ed. Univ. "Politehnica", Timișoara, 1998 3. Medvedovici, A., <i>Noțiuni fundamentale și marimi caracteristice în cromatografie</i> , Univ Bucuresti , 1998 4. Ciucanu, I., <i>Metode Fizico-Chimice în Analiza Chimica Instrumentala</i> , Editura Mirton, Timisoara, 1996		

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 we preparing the content of the discipline, the requirements of representative employers in the field of the chemical industry were taken into account, whose activity also includes laboratory analysis as well as quality control of technological processes.

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Knowledge assessment interest	Assessment: oral exam for spectroscopic methods and grid exam for chromatographic methods	66%
10.5 Applied activities	S: Assessment of practical knowledge	Written evaluation/grid tests	34%
	L:		
	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"> • Solving at least 50% of the subjects in the oral and written examination and at least grade 5 in the activity of the semester – laboratory activity 			

Date of completion

11.12.2024

**Course coordinator
(signature)**

Valentin BADEA

**Coordinator of applied activities
(signature)**

Valentin BADEA

Laurențiu Valentin ORDODI

Laurențiu Valentin ORDODI

**Head of Department
(signature)**

S.L.dr.ing. Andra TĂMAȘ

Date of approval in the Faculty Council ¹⁸

**Dean
(signature)**

S.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.