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 / CAICAM + 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]			Fertilizers and Pesticides/ DS				
2.2 Coordinator (holder) of course activities			Assoc.Prof.PhD. Eng. Mihaela CIOPEC / Assoc.Prof.PhD.Eng. Simona POPA				
2.3 Coordinator (holder) of applied activities[5]			……				
2.4 Year of study[6]	III	**2.5** Semester	6	**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	5 of which:	**3.2** course	2.5	**3.3** seminar / laboratory / project	0/2.5/0
3.1* Total number of fully assisted hours / semester	70 of which:	**3.2*** course	35	**3.3*** seminar / laboratory / project	0/35/0
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	0.36 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	5 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]	5.36				
3.8* Total hours /semester	75				
3.9 Number of credits	3				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• Chemistry, Analytical chemistry and instrumental analysis, Inorganic, Basics of Chemical Technology, Coordination and organometallic chemistry, Spectroscopic

[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.

	and chromatographic methods
4.2 Competencies	• To complete the course, students must have minimal knowledge of the description, analysis and use of fundamental concepts and theories in the field of engineering sciences, inorganic and organic chemistry and chemical engineering • The use of various modern methods of analysis. Chemical analysis calculations

5. Conditions (where applicable)

5.1 of the course	• Lecture hall equipped with video projector and blackboard
5.2 to conduct practical activities	• Appropriately equipped laboratory room

6. Specific competencies acquired through this discipline

Specific competencies	• Knowledge and appropriate use of discipline-specific notions • Understanding the fundamental phenomena specific to the discipline • Knowledge of the pesticides main characteristics used in the food industry • Methods for the analysis of pesticides in food products and in the environment
Professional competencies ascribed to the specific competencies	• - 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.

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

7.1 The general objective of the discipline	Ensuring the skills necessary to explain and interpret the principles and methods used in the processes specific to the chemical industry for obtaining fertilizers and pesticides • Acquiring the necessary knowledge to create some design elements for processes specific to fertilizer technology • The objective of the discipline is for students to acquire knowledge about the main characteristics of pesticides, their conditioning, as well as different methods of their analysis in food products and in the environment
7.2 Specific objectives	• Interpretation of the principles and methods used in the industrial synthesis of fertilizers • Recognition of the basic elements of the chemical technologies for obtaining fertilizers and those for depollution • Familiarization with pesticide analysis methods. Performing chemical analysis calculations

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Generalities: The importance of fertilizers; Types of fertilizers; Characteristics of fertilizers; The production of fertilizers	2.5	Lecture-debate, case study, cooperative learning methods and techniques. Interactive course using modern presentation methods
Fertilizers of the NPK type: generalities; types of NPK fertilizers, technological processes for obtaining NPK fertilizers	5	
Fertilizers with microelements: Generalities, types of fertilizers with microelements, technological processes for obtaining fertilizers with microelements, complex combinations of microelements	5	
Foliar fertilizers with microelements: Generalities, types of fertilizers, technological processes of obtaining. Valorization of some inorganic waste to obtain fertilizers with microelements	5	
Raw materials for the synthesis of aromatic intermediates. Notions about the synthesis of aromatic intermediates	5	
Pesticides: Definition, classification, uses, characteristics, conditioning	2.5	
Natural substances used in the fight against insects. Fungicides	2.5	
Organophosphorus insecticides. Carbamic insecticides. Substances used to combat plant diseases	2.5	
Herbicides. Phytohormones. Rodenticides	2.5	
Monitoring pesticide levels in food and in the environment. Consumer protection aspects	2.5	
	2.5	

Bibliography [12] 1.R.P. Dipak, Fertilizers, Ed. New Publishing Agency 101, 2021
2. Vasant Gowariker, V.N. Krishnamurthy; S. Gowariker; M. Dhanorkar; K. Paranjape; Ed. Wiley, 2008
3. Travis P. Hignett, Ferilizer Manual, Springerlink, 1985;
4. A. Iovi, C. Iovi, P. Negrea, Chimia si Tehnologia Ingrasamintelor Complexe, Ed. Politehnica, 1999;
5. A. Iovi, C. Iovi, P. Negrea, Chimia si Tehnologia Ingrasamintelor cu Microelemente, Ed. Politehnica, 2000
6. M. Ciopec, Studii privind obţinerea şi caracterizarea îngrăşămintelor de tipul PK cu microelemente", Universitatea Politehnica Timisoara 2007;
7.Simona Popa, *Fundamente şi aplicaţii pentru industria de sinteză organică fină şi de procesare a produselor naturale*, vol.I,II, Ed. Politehnica, Timişoara, 2012-2013;
8. A.T. Balaban, M. Banciu, I. Pogany, *Aplicaţii ale metodelor fizice în chimia organică*, Ed. Ştiinţifică şi Enciclopedică, Bucureşti,1983
9. Jose L. Tadeo (Ed.), *Analysis of pesticides in food and environmental samples*, CRC Press, 2008
10. E. Comăniţă, C. Soldea, E. Dumitrescu, *Chimia şi tehnologia pesticidelor*, Ed. Tehnic,aBucureşti, 1986
11. C.R. Worthing, S. B. Walker (Ed.), *The Pesticide Manual,* Tehe British Crop Protection Council, London, 1983

8.2 Applied activities [13]	Number of hours	Teaching methods
Introduction to the Fertilizers laboratory. General and specific OSH and SU rules	2.5	Participatory lecture; Carrying out laboratory works, studying and interpreting the results, solving problems, debating
Obtaining and characterizing potassium nitrate through the double exchange reaction between sodium nitrate and potassium chloride	2.5	
Obtaining calcium nitrate from limestone and nitric acid	2.5	
Obtaining cobalt-ammonium phosphate	2.5	
Obtaining fertilizers from waste from the inorganic chemical industry	2.5	
Obtaining liquid fertilizers	2.5	
Recovery	2.5	
Introduction to the Pest Control laboratory. General and specific OSH and SU rules	1.5	
Knowledge of the methods of sampling samples containing	3;5	

[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".

pesticides, for analysis		
Analysis of pesticides by modern analytical techniques	2.5	Participatory lecture; Carrying out laboratory works, studying and interpreting the results, solving problems, debating
Determination of pesticides in food of vegetable origin	2.5	
Determination of pesticides in food of animal origin	2.5	
Determination of pesticides in soil	2.5	
Determination of pesticides in water	2.5	

Bibliography [14] Iovi A., Negrea P., Tehnologia ingrasamintelor minerale, Indrumator de laborator, Centru de multiplicare Universitatea „Politehnica" Timisoara, 1997

2.Simona Popa, *Fundamente şi aplicaţii pentru industria de sinteză organică fină şi de procesare a produselor naturale*, vol.I,II, Ed. Politehnica, Timişoara, 2012-2013

3. A.T. Balaban, M. Banciu, I. Pogany, *Aplicaţii ale metodelor fizice în chimia organică*, Ed. Ştiinţifică şi Enciclopedică, Bucureşti,1983

4. Jose L. Tadeo (Ed.), *Analysis of pesticides in food and environmental samples*, CRC Press, 2008

5. E. Comăniţă, C. Soldea, E. Dumitrescu, *Chimia şi tehnologia pesticidelor*, Ed. Tehnic,aBucureşti, 1986

6. C.R. Worthing, S. B. Walker (Ed.), *The Pesticide Manual,* Tehe British Crop Protection Council, London, 1983

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 content of the discipline is consistent with what is done in other university centers in the country and abroad. For a better adaptation to the requirements of the labor market of the content of the discipline, study visits to specialized industrial units can take place
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10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Part I: The answer to the examination subjects from the course area Part II: correctness and completeness knowledge; - logical coherence; - degree of assimilation a the language of specialty; - targeting criteria attitudinal aspects: conscientiousness, interest in study individual	Part I: Written exam, testing the knowledge presented in the course Part II: Written exam, testing the knowledge presented in the course. The weighted average is calculated only if the student proves sufficient minimum knowledge in the written exam. For grade 5, the student must know the fundamentals of theory. To obtain grade 10, the student must prove in-depth knowledge and the ability to correctly apply the assimilated knowledge. The student must highlight the essential aspects and show that he has not mastered them mechanically	60%
10.5 Applied activities	**S:**		
	L: Part I: Solving problems corresponding to laboratory works Part II: Execution of laboratory works. Doing homework	Part I: Answers to questions, presentation of reports. Evidence of attendance Part II: The method of carrying out the laboratory works and the interpretation of the obtained results are evaluated in a continuous manner. For grade 5, the student must perform the laboratory work and interpret the experimental data at a basic level. For grade 10, the student must actively participate in laboratory	40%

[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.)

		work, solve problems, answer questions and independently, correctly and completely interpret the data obtained and do homework	
	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])

Knowledge of the basic elements of the technologies for obtaining fertilizers. Knowledge of the fundamental elements in the field of pesticides, their use and analysis methods

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Date of completion	**Course coordinator (signature)** Assoc.Prof. Habil. PhD. Eng. Mihaela CIOPEC Assoc.Prof. Habil. PhD. Eng. Simona POPA	**Coordinator of applied activities (signature)**
Head of Department (signature) Conf.dr.ing. Andrea KELLENBERGER Ș.L.dr.ing. Andra TĂMAȘ	**Date of approval in the Faculty Council** [18]	**Dean (signature)** Ș.L.dr.ing. Mircea Laurențiu DAN

[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.