

# SYLLABUS

## 1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty <sup>1</sup> / Department <sup>2</sup>	Chemical Engineering, Biotechnologies and Environmental Protection / CAICON + CAICAM
1.3 Field of study (name/code <sup>3</sup> )	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 <sup>4</sup>	Equipments in chemical industry / DS						
2.2 Coordinator (holder) of course activities	Conf.dr.ing. Simona POPA / Ş.I.dr.ing. Cosmin VANCEA						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Conf.dr.ing. Simona POPA / Ş.I.dr.ing. Cosmin VANCEA						
2.4 Year of study <sup>6</sup>	III	2.5 Semester	5	2.6 Type of evaluation	E	2.7 Regime of discipline <sup>7</sup>	DI

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

3.1 Number of fully assisted hours / week	3 of which:	3.2 course	1.5	3.3 seminar / laboratory / project	0/1.5/0
3.1* Total number of fully assisted hours / semester	42 of which:	3.2* course	21	3.3* seminar / laboratory / project	0/21/0
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	4.14 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1.1
		hours of individual study after manual, course support, bibliography and notes			4
		training seminars / laboratories, homework and papers, portfolios and essays			2
3.7* Number of hours of unassisted activities / semester	58 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			16
		training seminars / laboratories, homework and papers, portfolios and essays			28
3.8 Total hours / week <sup>9</sup>	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"> <li>Physical chemistry, The basics of chemical engineering, Transfer phenomena, Solid state physical chemistry</li> </ul>
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<sup>1</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs

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

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

<sup>4</sup> 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).

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

<sup>6</sup> Year of studies in which the discipline is provided in the curriculum.

<sup>7</sup> 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).

<sup>8</sup> 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.

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

4.2 Competencies	<ul style="list-style-type: none"> <li>• Transfer phenomena</li> </ul>
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### 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li>• Students will attend lectures, the course is interactive, students can ask questions about the content of the presentation. Students will go through the indicated bibliography. Room equipped with video projector, blackboard</li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li>• Laboratory equipped according to requirements, with specialized equipment and computing techniques</li> </ul>

### 6. Specific competencies acquired through this discipline

Specific competencies	<p>Knowing how each technology is organized</p> <ul style="list-style-type: none"> <li>• Knowledge of raw material preparation operations</li> <li>• Knowledge of the operations and operating principles of the machines that ensure the reaction conditions</li> <li>• Knowledge of the operations and operating principles of the machines for the separation and purification of the useful product</li> <li>• Identification and application of concepts, methods and theories for solving typical chemical process engineering problems under conditions of qualified assistance</li> <li>• Critical analysis and use of working principles, methods and techniques for the quantitative and qualitative assessment of chemical engineering processes</li> </ul> <ul style="list-style-type: none"> <li>• • The ability to use laboratory facilities to collect the data necessary to prepare material balances and calculate the efficiency of the process</li> </ul>
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>• - Analyse production processes for improvement;</li> <li>• - Manage chemical testing procedures;</li> <li>• - Test materials;</li> <li>• - Write technical reports</li> <li>• -Performs chemical experiments</li> <li>• -Approve engineering design</li> <li>• -Assess environmental impact</li> </ul>

Transversal competencies ascribed to the specific competencies

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

<ul style="list-style-type: none"> <li>•</li> </ul>
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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	<ul style="list-style-type: none"> <li>• The aim of the discipline is for the students to acquire the concepts and methods necessary for the analysis, design and optimal management of the machines specific to the industry, in the processing of products, as well as the development of skills regarding the choice, operation and maintenance of the machines in the manufacturing lines</li> </ul>
7.2 Specific objectives	<p>Familiarity with engineering calculations related to the sizing of machinery on technological flows, as well as calculations regarding the productivity and efficiency of machinery</p> <ul style="list-style-type: none"> <li>• The use of basic knowledge specific to chemical engineering for the characterization of equipment specific to chemical processes</li> </ul>

### 8. Content <sup>10</sup>

<sup>10</sup> 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 "(\*)".

8.1 Course	Number of hours	Teaching methods <sup>11</sup>
Elementary functions and functional elements. The structure of a chemical engineering enterprise	1.5	Interactive course using modern teaching methods
The technological process and the calculation of the technological installation	2.5	
Preliminary operations for the preparation of raw material from the organic chemical industry and specific equipment	3	
Technological processes in the organic chemical industry – specific machines	3.5	
Classification of industrial processes. Specific equipment depending on the type of process	2	
Protection of Chemical Production Equipment. Operation and Maintenance of Machinery	1.5	
Raw material exploitation. Specific equipment	1	
Transport of raw materials. Specific transport equipment inside and outside the factory premises	2	
Feeding and dosing. Specific equipment	1	
Grinding. Sorting. Specific equipment	1	
Drying. Specific equipment	1	
Thermal processes. Specific equipment	1	
Bibliography <sup>12</sup> 1. Simona Popa, Utilaje in industria chimică organică, Ed. Politehnica Timișoara, 2017 2. Simona Popa, Specific Plant in Organic Chemistry Industry, Ed. Politehnica Timișoara, 2021 3. K.F.Pavlov,s.a., Procese si aparate in ingineria chimica, Ed.Teh., Bucuresti, 1981 4. A.Banescu, D.Radulian, Sistematizarea calculelor aparatelor in industria chimica, Ed.Teh., Bucuresti 1977 5. Simona Popa, Zlatimir Stanoiev, Principii și fundamente de proiectare a compușilor chimici organici finiți, Ed. Politehnica, 2013 6. Simona Popa, Zlatimir Stanoiev, Tehnologii și utilaje în industria chimică organică, Ed.Mirton, Timișoara, 2003 7. N.P. Lieberman, E.T. Lieberman, A working guide to process equipment,4th Edition, McGraw Hill Education, 2014 8. D.M. Himmelblau, J.B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8 <sup>th</sup> Edition, Pearson, 2012 9. U.P. Nnaji, Introduction to Chemical Engineering (For Chemical Engineers and Students), John Wiley & Sons, 2019 10. C. Vancea, Noi solutii de imobilizare a unor deseuri industriale in matrici vitroase, (teza doctorat), Editura Politehnica Timișoara, 2013		
8.2 Applied activities <sup>13</sup>	Number of hours	Teaching methods
Introduction to the Laboratory of Machinery in the Organic Chemical Industry. General and specific OSH and SU rules	1	Participatory lecture, brainstorming, carrying out laboratory work with the presentation of results in the form of reports
Material balance and heat balance. Technological flow. Preparation of a technological scheme	3	
Determination of the viscosity of liquids using the Brookfield viscometer	3	
Determining the humidity of substances by drying with the help of the thermobalance	2	
Determination of the density of liquids and solids using the pycnometer	1.5	
Introduction to the Laboratory of Machinery in the Chemical Industry. General and specific OSH and SU rules	1	Participatory lecture, brainstorming
General principles applied in chemical engineering processes and equipment calculations	3	
Grinding and sorting	3	
Drying. Thermal processes	3.5	

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

<sup>12</sup> 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.

<sup>13</sup> 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<sup>14</sup>

1. Simona Popa, Zlatimir Stanoiev, Tehnologii și utilaje în industria chimică organică, Ed.Mirton, Timișoara, 2003
- 2.A.Banescu, D.Radulian, Sistematizarea calculelor aparatelor in industria chimica, Ed.Teh., Bucuresti 1977
- 3.K.F.Pavlov,s.a., Procese si aparate in ingineria chimica, Ed.Teh., Bucuresti, 1981
4. Simona Popa , Referatele lucrărilor de laborator
5. Simona Popa, Zlatimir Stanoiev, Principii și fundamente de proiectare a compușilor chimici organici finiți, Ed. Politehnica, 2013
6. Simona Popa, Utilaje in industria chimică organică, Ed. Politehnica Timișoara, 2017
7. Simona Popa, Specific Plant in Organic Chemistry Industry, Ed. Politehnica Timișoara, 2021
8. E.B. Nauman, Chemical reactor design, optimization and scaleup, McGraw Hill, 2002
9. K.A. Solen, J.N. Harb, Introduction to chemical engineering, John Wiley&Sons, 2011
- 10 D.M. Himmelblau, J.B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8th Edition, Pearson, 2012

**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 contributes to the accumulation of 6 professional competencies established through the prior consultation of representatives of the epistemic community, professional associations and representative employers in the field related to the program and specified in the National Register of Higher Education Qualifications, RNCIS

**10. Evaluation**

Type of activity	10.1 Evaluation criteria <sup>15</sup>	10.2 Evaluation methods	10.3 Share of the final grade
<b>10.4 Course</b>	Part I. Two theoretical subjects from the subject taught in the course Solving a theoretical calculation problem	Part I. 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	50%
	Part II. Acquiring, describing and using general notions regarding operations and equipment specific to the chemical industry	Part II. Exam – grid test 18 questions	
<b>10.5 Applied activities</b>	<b>S:</b>		
	<b>L:</b> Execution of laboratory works. Doing homework	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 work, solve problems, answer questions and independently, correctly and completely interpret the data obtained and do homework	50%
	<b>P<sup>16</sup>:</b>		
	<b>Pr:</b>		
<b>10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified<sup>17</sup>)</b>			

<sup>14</sup> At least one title must belong to the discipline team.

<sup>15</sup> 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.)

<sup>16</sup> 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.

<sup>17</sup> It will not explain how the promotion mark is awarded.

- The minimum standard of performance requires knowing how to create a technological scheme, a material balance and a heat balance for a given technology, doing homework, laboratory work and handing in the appropriate reports, as well as solving each subject on the exam for grade 5.

**Date of completion**

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

Conf.habil.dr.ing. Simona POPA

Conf.habil.dr.ing. Simona POPA

S.I.habil.dr.ing. Cosmin VANCEA

S.I.habil.dr.ing. Cosmin VANCEA

**Head of Department  
(signature)**

**Date of approval in the Faculty Council <sup>18</sup>**

**Dean  
(signature)**

Ș.L.dr.ing. Andra TĂMAȘ  
Conf..dr.ing. Andrea  
KELLENBERGER

Ș.L.dr.ing. Mircea Laurențiu DAN

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