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]			Transfer Phenomena I. Hydrodynamics / DD				
2.2 Coordinator (holder) of course activities			S.L. dr.ing. Sorina BORAN				
2.3 Coordinator (holder) of applied activities[5]			S.L. dr.ing. Sorina BORAN				
2.4 Year of study[6]	II	**2.5** Semester	4	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DI

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	1/1/0
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	14/14/0
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			
		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	44 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]	7.14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• math, physics, physical chemistry
4.2 Competencies	• Description, analysis and use of the concept and fundamental theories in the field

[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.

	of engineering sciences, chemistry and chemical engineering

5. Conditions (where applicable)

5.1 of the course	• Medium-sized room equipped with blackboard, computer and overhead projector
5.2 to conduct practical activities	• Specialized laboratory

6. Specific competencies acquired through this discipline

Specific competencies	• Knowledge of conservation relations • Knowledge of similarity relationships • Knowledge of the operating principles of the main types of specific equipment
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 acquire the theoretical principles, design, construction and operation of equipment in operations based on impulse transfer
7.2 Specific objectives	• Learning the principles regarding the operating regimes of the installations • Understanding and mastering the laws of fluid motion • Knowledge of the characteristic quantities in the transport of fluids as well as of the corresponding equipment • Acquiring the principles underlying the mixing operation as well as the types of mixing devices • Understanding and using the quantities characteristic of the separation operation in solid-gas, respectively solid-liquid system and knowledge of specific equipment • Acquisition of knowledge on fluidization and pneumatic transport

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Introduction - Dimensional analysis, similarity, material balance and	2	

[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.).

energy balance		
Fluid flow - rheological characterization of fluids, flow regimes, pressure losses through pipes and columns with filling, Bernoulli's equation, flow measurement, leakage from tanks	9	
Fluid transport - pumps, gas compression and vacuum	6	
Mixing materials and types of mixers	3	
Sedimentation and settling	3	
Filtration	3	
Centrifugation	2	

Bibliography [12] 1. Emilian A. Bratu, Operatii Unitare In Ingineria Chimica. Vol. I, Ed. Tehnică, București, 1984
2. Christie J. Geankoplis, Transport Processes and Unit Operations, Ed. Prentica Hall PTR, New Jersey, 1993
3. Kohn D., Șora M., Pode V., Fenomene de transfer și utilaje în industria chimică - Procese hidrodinamice, vol. I și II, Litografia U.T. Timișoara, 1993
4. Edward L. Paul, Victor A. Atiemo-Obeng, Suzanne M. Kresta, Handbook of Industrial Mixing: Science and Practice, John Wiley&Sons, Hoboken, New Jersey, 2004
5. V.Pode, Procese hidrodinamice, Ed. Politehnica, Timișoara, 2011
6. G. Jinescu, Procese Hidrodinamice și utilaje specific în industria chimică, Editura Didactică și Pedagogică, București, 1983
7. Miclăuș A., Pode V., Cazuri particulare de curgere a fluidelor ideale și reale, Casa Cărții de Știință, Cluj-Napoca, 2018
8. Kauffman, G.B. Ullmann's Encyclopedia of Industrial Chemistry Fifth Edition, First International Edition in English by Wolfgang Gehartz, Gail Schulz Thomas Kellersohn, Barbara Elvers, Stephen Hawkins, and Ulrike Winter (Eds.). *Chem. Educator* **5,** 49–53 (2000)
9. C. Pavlov, Procese și aparate în ingineria chimică Exerciții și probleme, Ed. Tehnică, 1981

8.2 Applied activities [13]	Number of hours	Teaching methods
Seminar	14	Discussions related to the topic, carrying out practical work and interpreting the results
Numerical applications related to the theoretical notions presented	14	
Laboratory	14	
Labor protection training. Determination of density and viscosity of liquids	3	
Determination of flow rate and coefficient of friction when fluids flow through circular pipes	2.5	
Determination of pressure losses in filled columns	2	
Draining liquids from tanks	2	
Gas flow measurement	2	
Experimental determination and criterion calculation of agitation power	2.5	

Bibliography [14] 1. C. Pavlov, Procese și aparate în ingineria chimică Exerciții și probleme, Ed. Tehnică, 1981
2. Z. Gropșian, M. Medeleanu, D. Kohn, L.Iovi, M. Moraru, R. Minea, M. Șora, Îndrumător de lucrări practice, Litografia IPTV Timișoara, 1982, pag. 3, 9, 17, 43
3. D. Kohn, R. Minea, M. Șora, L. Gabor, D. Gabor, V. Pode, A. Rus, Îndrumător de lucrări practice, Litografia UT Timișoara, 1992, pag. 3, 59
4. Kohn D., Șora M., Pode V., Fenomene de transfer și utilaje în industria chimică - Procese hidrodinamice, vol. I și II, Litografia U.T. Timișoara, 1993

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 in line with the partial competencies required for the possible occupations provided in Grila 1 - RNCIS

[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.

10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Verification of the correct and complete acquisition of the basic theoretical notions	Written exam lasting 3 hours. Half of the time is allocated to the theoretical part, and the other half to solving numerical applications	60%
10.5 Applied activities	**S:** Ability to operate with the notions learned in the course; calculation skills	Checking homework	15%
	L: Verification of the acquisition of the theoretical notions necessary to carry out the practical works; performing the correct experimental determinations and corresponding calculations; degree of involvement in current activities and presence at laboratory work	Verification of the reports that include the interpretation of the experimental results, respectively the graphic determinations for each laboratory work	25%
	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])			
• The grade for the ongoing activity can be awarded only if the student has fully participated in the application activities and taught the related refrains. In the written exam the answers to the questions / problems must accumulate a score of at least 4 points out of a total of 9 possible			

Date of completion	**Course coordinator (signature)** S.L.dr.ing. Sorina BORAN	**Coordinator of applied activities (signature)** S.L.dr.ing. Sorina Boran
Head of Department (signature) S.L.dr.ing. Andra TĂMAȘ	**Date of approval in the Faculty Council** [18]	**Dean (signature)** 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.