

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	Modeling and simulation of processes in chemical engineering / DS						
2.2 Coordinator (holder) of course activities	S.L.dr.ing. Ana-Maria PANĂ						
2.3 Coordinator (holder) of applied activities ⁵	S.L.dr.ing. Ana-Maria PANĂ						
2.4 Year of study ⁶	IV	2.5 Semester	7	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	3.5 of which:	3.2 course	1.5	3.3 seminar / laboratory / project	0/2/0
3.1* Total number of fully assisted hours / semester	49 of which:	3.2* course	21	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	3.64 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1.14
		hours of individual study after manual, course support, bibliography and notes			1
		training seminars / laboratories, homework and papers, portfolios and essays			1.5
3.7* Number of hours of unassisted activities / semester	51 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			16
		hours of individual study after manual, course support, bibliography and notes			14
		training seminars / laboratories, homework and papers, portfolios and essays			21
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	• Physical Chemistry, Hydrodynamics, Heat and mass transfer, Chemical Reactors
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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.

4.2 Competencies	<ul style="list-style-type: none"> • Basic knowledge in the field of chemical and biochemical engineering
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5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> • Classroom provided with writing board and videoprojector
5.2 to conduct practical activities	<ul style="list-style-type: none"> • Laboratory class provided with computers and adequate software

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • Chemical industrial equipment modeling, dimensioning and proper functioning inside the working flow. • Understanding the functioning principles of an industrial plant, identification of key-parameters of the technological process.
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 • -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.

<ul style="list-style-type: none"> •

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 main objective of the discipline is to provide know-how regarding the modeling of chemical industrial processes.
7.2 Specific objectives	<ul style="list-style-type: none"> • The ability to understand the principles of chemical processes modeling.

8. Content¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
Modeling of chemical technological processes: definition, stages, tools	3	Interactive teaching skills, lecture, demonstration, problem solving, cooperation teaching. Video-projector lecture and black-board explanations for knowledge
Identification of mathematical equations for modeling of continuous and batch processes	3	
Mathematical modeling techniques. Identification of key-parameters for process modeling	3	
Software used for chemical processes modeling. Examples	3	
Modeling of unitary processes using interactive software Aspen Hysys. Properties packages employed for chemical compounds.	3	

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.).

Extraction and distillation plants modeling using Aspen Hysys	3	consolidation.
Reactors modeling using Aspen Hysys	3	
Bibliography ¹² 1. Green D.W., Perry R.H., Perry's Chemical Engineers' Handbook, Eighth Edition, McGraw-Hill, 2008 2. Simpson R., Sastry S., Chemical and Bioprocess Engineering, Springer Ed, New York, 2013 3. Froment G.F., Bischoff K.B., de Wilde J., Chemical Reactor Analysis and Design, 3rd Edition, Jon Wiley and Sons, 2010 4. Levenspiel O., Engineering Flow and heat Exchange, Third Edition, Springer, New York, 2014 5. Pană Ana-Maria, Proiectare asistată, note de curs, disponibil online https://cv.upt.ro/course/view.php?id=2273		
8.2 Applied activities ¹³	Number of hours	Teaching methods
Software for modeling chemical industrial processes. Examples. Equations of state. Matlab, Excel and Hysys applications	4	Modeling of chemical industrial processes using specific software (Aspen Hysys).
Aspen Hysys: introduction. Properties packages, process flow diagram. Modeling of unitary processes	4	
Distillation/rectification modeling and simulation in Aspen Hysys. Mathematical equations of models employed.	4	
Modeling and simulation of reactors in Aspen Hysys. Continuous flow, mathematical modeling	4	
Modeling of absorption process in Aspen Hysys. Packed bed columns	4	
Modeling and simulation of a continuous flow reaction system using recycling unit	4	
Modeling and simulation of heat exchangers	4	
Bibliography ¹⁴ 1. Hahn B.D., Essential Matlab for Scientists and Engineers, Second Edition, Butterworth Heinemann, Oxford, 2002 2. Hayday J., Chemical Process Design and Simulation: Aspen Plus and Aspen Hysys Applications, Wiley-AIChE, 2019 3. Pleșu V., Inițiere în utilizarea simulatorului HYSYS, vol. 1-2, Editura Bren, 2001 3. https://www.aspentech.com/en/products/pages/aspens-process-manua		

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

<ul style="list-style-type: none"> The syllabus is developed according to the requirements in the chemical/biochemical engineering field, being similar to other disciplines from Romanian universities and abroad. The syllabus was written considering the requirements and expectations of the employers in the field. These aspects were identified during discussions between Chemical Engineering Board members; the economic environment is well represented with distinguished representatives on this Board. The competencies acquired will be of great use for employes working in chemical plants, but also in research and development facilities, including design of chemical equipment.

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Fundamentals of chemical and biochemical processes modeling	Written examination	0.66
10.5 Applied activities	S:		

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.

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.)

	L: Applicative activities attendance. Mathematical modeling of chemical process and Aspen Hysys modeling	Quiz	0.34
	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"> • Basic knowledge in modeling of chemical processes; • Attendance at all laboratory sessions. 			

Date of completion

**Course coordinator
(signature)**

Ș.I.dr.ing. Pană Ana-Maria

**Coordinator of applied activities
(signature)**

Ș.I.dr.ing. Pană Ana-Maria

**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

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.