

# COURSE SYLLABUS

## 1. Program information

1.1. Institution	Petroleum-Gas University of Ploiești
1.2. Faculty	Petroleum Refining and Petrochemistry
1.3. Department	Petroleum Processing Engineering and Environmental Protection
1.4. Field of study	Chemical Engineering
1.5. Study cycle	Master degree
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

## 2. Course information

2.1. Course title	<b>3D plant design in the chemical industry</b>
2.2. Course coordinator	Professor PhD. Eng. Cursaru Diana-Luciana
2.3. Laboratory / seminar / coordinator	Professor PhD. Eng. Cursaru Diana-Luciana
2.4. Project coordinator	Professor PhD. Eng. Cursaru Diana-Luciana
2.5. Year of study	II
2.6. Semester *	3
2.7. Evaluation type	Exam
2.8. Course type - formative category **/ Type of subject matter ***	SC/MND

\* The semester number is according to the curriculum.

\*\* FC – Fundamental courses; SC – Specialization courses; CC – Complementary courses.

\*\*\* Mandatory/imposed = MND; Optional = OPT; Elective = ELE.

## 3. Total estimated time (teaching hours per semester)

3.1. Number of hours per week	5	of which: 3.2. course	2	3.3.Seminar/laboratory	2	3.4.Project	1
3.5. Total hours from curriculum	50	of which: 3.6. course	20	3.7. Seminar/laboratory	20	3.8. Project	10
3.9. Total hours of individual study (Study of textbook, course support, bibliography, study of textbook, course support, further reading in the library, on online platforms, preparing seminars/laboratories, homework, portfolios and essays)							100
3.10. Total hours per semester							150
3.11. Number of credits							5

## 4. Requirements (where applicable)

4.1. Curriculum requirements	<ul style="list-style-type: none"> <li>➤ Knowledge of mathematic</li> <li>➤ Knowledge of chemical engineering</li> <li>➤ Knowledge of mechanical engineering</li> </ul>
4.2. Course requirements:	<ul style="list-style-type: none"> <li>➤ Room equipped with video projector</li> </ul>
4.3.Seminar/Laboratory requirements:	<ul style="list-style-type: none"> <li>➤ Room equipped with video projector and computers with specific software for 3D design)</li> </ul>

## 5. Specific competences acquired and learning achievements\* outcomes

Professional competences	Learning achievements*
1. Designs equipment and installations for the chemical industry	<p>K1 - The student describes advanced principles of equipment sizing and operation.</p> <p>K2 - The student identifies modern technological solutions for process intensification.</p> <p>K3 - The student defines criteria for selecting materials and equipment depending on applications.</p> <p>S1 -The student uses computer-aided design methods.</p> <p>S2 - The student develops technological schemes and mass and energy balances.</p> <p>LO1 - The student assumes responsibility for coordinating engineering projects.</p> <p>LO2 - The student collaborates effectively in multidisciplinary teams.</p>
Transversal competences	Learning achievements*
1. Collaborates effectively in multidisciplinary and intercultural teams	<p>K1 - The student explains the dynamics and roles of members in a multidisciplinary team.</p> <p>S1 - The student actively participates in team activities and contributes to achieving common goals.</p> <p>S2 - The student uses collaboration and communication management tools.</p> <p>LO1 - The student assumes responsibility for their role in the team and respects cultural diversity.</p> <p>LO2 - The student demonstrates autonomy and initiative in conflict resolution and collaboration facilitation.</p>

\* K – knowledge; S – skills; LO – responsibility and autonomy.

## 6. Course objectives (derived from the list of specific competences acquired)

6.1. General objective	At the end of the course the student will have basic knowledge on the 3D design of the equipment specific to the chemical industry and the chemical industry facilities. Throughout the course, knowledge transfer will be made on the use of the PDMS_AVEVA simulator in the design of chemical industry equipment.
6.2. Specific objectives	<p>After completing the discipline students will be able to:</p> <p>Understand and identify correctly the concepts used in the design;</p> <p>Know and interpret the structure of the model of a design problem;</p> <p>Choose and develop a 3D design method.</p> <p>Have the ability to evaluate, explain and interpret the processes that are the subject of design;</p> <p>Have the ability to analyze and interpret the optimal solutions of a design problem. Have the ability to formulate opinions and to persevere for the purpose of professional self-improvement.</p>

## 7. Contents

7.1. Course	Time	Teaching methods	Comments
1. Design methodology (investment stages and related design documentation)	4	Interactive, based on multimedia and student-centered techniques	Course support and recommended references
2. Basis of design (types of technological schemes)	4		

3. Project design (criteria and ways of designing technological schemes: operating regime, operating flexibility, energy saving, technological multifunction, capacity enhancement and process development and technological process integration - environmental protection)	4		
4. Equipment and piping assembly (machine installation principles, piping installation systems, mounting plans, thermal and thermal insulation of pipelines and equipment).	4		
5. 3D design of a plant. Coupling of projected equipment. Making the isometric scheme of a projected plant	4		
<b>Bibliography</b>			
<ol style="list-style-type: none"> <li>1. Silla, H., Chemical Process Engineering. Design and Economics, Ed. By Dekker, New York, 2003</li> <li>2. Towler, G., Sinnott, R., Chemical Engineering Design, Ed. Elsevier, New York, 2007</li> <li>3. Baasel, W., Preliminary Chemical Engineering Plant Design, Elsevier, New York, 2008</li> <li>4. Coulson, J.M., Richardson., J.F., Chemical Engineering, Pergamon Press, Oxford, 1979</li> <li>5. AVEVA Plant Hands On Overview</li> <li>6. AVEVA Plant Drawing Production</li> </ol>			
<b>7.2. Seminar / laboratory</b>	<b>Time</b>	<b>Teaching methods</b>	<b>Comments</b>
1. Designing equipment with primitives in the AVEVA_PDMS library	3	Interactive, based on multimedia and and design software such as AVEVA_PDMS.	
2. Design of a steel structure made of columns and stiffening beams. Filling with curved beams-part I	3		
3. Design of a steel structure made of columns and stiffening beams. Filling with curved beams-part II	3		
4. Designing a tubing support	3		
5. Designing a platform	3		
6. Designing an Access Stair	3		
7. Generating of P&ID	2		
<b>Bibliography</b>			
<b>7.3 Project</b>	<b>Time</b>	<b>Teaching methods</b>	<b>Comments</b>
3 D design of a plant from chemistry and petrochemistry industry.	10	Interactive, based on multimedia and and design software such as AVEVA_PDMS. The master students will work in a team of 3-4 people, each member of the team being responsible for designing an area.	
<b>Bibliography</b>			
<ol style="list-style-type: none"> <li>1. AVEVA Plant Pipework modelling</li> <li>2. AVEVA Plant Drawing Production</li> <li>3. AVEVA Plant Structural Modelling</li> </ol>			

## 8. Correlation of the course contents with the demands of the epistemic community representatives, professional associations, and representative employers in the field of the program

The content of the subject as well as the theme of the laboratory works correspond to the curriculum in other university centers. In order to better adapt to the requirements of the labor market the content of the discipline, there were meetings with representatives of economic partners, graduates and professors from the faculties that have the specialty of computer-assisted chemical engineering.

## 9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Percentage of final grade
9.4. Course	Formation of the necessary rationale base for modeling activity of chemical engineering structures	Final exam containing a written and practical test for assessing the knowledge on modeling of a chemical industry specific structure.	40%
	Frequency to the course	Presence at the course, participation in debates, stimulation of critical thinking	10 %
9.5. Seminar/laboratory	Application of the fundamental knowledge of the discipline in the design activity and the realization of the models following the schemes of the installations	Presentation of the models made during the laboratory hours	20 %
9.6. Project	Presentation of the 3D scheme of a plant in the chemical and petrochemical industry.	The presentation of the project will be done by the entire team that worked through a question-and-answer presentation based on the 3D scheme.	30 %
9.7. Minimum performance standard			
<ul style="list-style-type: none"> <li>➤ Participation to all laboratories.</li> <li>➤ Realization of the model of a structure specific to the chemical industry</li> <li>➤ Presentation of the project representing the 3D scheme of a plant specific to the chemical and petrochemical industry</li> <li>➤ All exam subjects should be evaluated with a minimum of 5 from 10.</li> </ul>			

Signature/date  
22.09.2025

Course coordinator

Laboratory coordinator

Project coordinator

Date of approval in the department  
26.09.2025

Head of department  
Associate prof.PhD. Eng.  
Neagu Mihaela

Dean  
Assist. PhD.Eng. Dușescu Vasile Cristina